SOUTHERN AFRICAN CUMACEA

PART 2

FAMILY BODOTRIIDAE, SUBFAMILY BODOTRIINAE

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(With 48 figures and 3 tables)

[*MS. accepted 18 January 1978*]

ABSTRACT

The Bodotriinae in southern Africa are represented by 34 species in 9 genera. 31 of these species are described and figured. 3 of the genera (*Alticuma*, *Austrocuma* and *Mossambicuma*) are new, as are 16 of the species (*Eocuma foveolatum*, *E. winri*, *E. aculeatum*, *Cyclaspoides pellucidus*, *Mossambicuma elongatum*, *Austrocuma platyceps*, *Alticuma bellum*, *Iphinoe producta*, *Cyclaspis scissa*, *C. australora*, *Bodotria clara*, *B. nitida*, *B. tenuis*, *B. falsinus*, *B. serica* and *B. vertebrata*). *B. vertebrata* is divided into two subspecies. The females of *I. dayi* and *Iphinoe? zimmeri* are described for the first time, as are the males of *A. carinata*, *C. spectabilis*, *B. magna* and *B. montagui*. *Alticuma carinatum* and *Iphinoe capensis* are allocated to different genera and *Iphinoe? zimmeri* is considered to be *incertae sedis*.

Keys are given to the genera of the Bodotriinae, the southern African species in the subfamily, the world species of *Eocuma* and the African and European species of *Iphinoe* and *Bodotria*.

The general distribution of the Bodotriinae is discussed and a more detailed account is given of the subfamily in southern African waters. It is concluded that the genera *Bodotria* and *Iphinoe* are the most successful in this region, contributing more than half of the species and 93 per cent of the individuals. The Bodotriidae in general and the Bodotriinae in particular are the most successful of the cumacean families in these waters.

CONTENTS

Ann. S. Afr. Mus. **75** (7), 1978: 159–290, 48 figs, 3 tables.

INTRODUCTION

This is the second in a series of papers on the Cumacea of Africa south of 20°S. The reader is referred to the first in the series (Day 1975) for a discussion of the structure and terminology of Cumacea in general, as well as a report on the taxonomy and distribution of the subfamily Vaunthompsoniinae in these waters.

There has been little previous work on the southern African Bodotriinae, and the cumacean fauna of the region is generally poorly known. The few earlier descriptions are to be found in: Zimmer's (1908) paper on the material from the Deutsches Tiefsee-Expedition and his report on the collection in the Berlin Zoologisches Museum (Zimmer 1921); two papers by Stebbing (1910, 1912); Fage's (1951) report on material from the Belgian Oceanographic Expedition; Jones's (1956) report on material from the *Atlantide* and *Galathea* Expeditions, and two papers on material collected by the Zoology Department of the University of Cape Town (Hale 1953; Jones 1960).

MATERIAL AND STATION DATA

The vast majority of samples used in this study was collected by the Zoology Department of the University of Cape Town (UCT) during a benthic survey round the South African coast, the programme being funded by the Oceanographic Research Institute of the Council for Scientific and Industrial Research (CSIR) and headed by J. H. Day. Other material was obtained from: the South African Museum, mostly collected by the S.S. *Pieter Faure* in 1898–1907 and the R.V. *Meiring Naude* in 1976–1977; the National Institute for Water Research of the CSIR; the Sea Fisheries Branch in Cape Town; a survey of Richards Bay conducted by the Port Elizabeth Museum; a survey of Lake St Lucia conducted by the Zoology Department of Rhodes University.

Due to the numerous samples and sources of material it is unpractical to list exact station data for each species. Thus in the distribution records the area of collection and the institution providing the material are designated by code letters and only extremities of range and depth are given. Table 1 lists the code letters and their geographical positions. These are also shown graphically in Figure 1.

METHODS

Collections: estuarine material was collected by means of plankton nets of various kinds and most benthic samples by grabs or dredges. A few of the UCT samples from the shallower stations at Lambert's Bay, Saldanha Bay, Still Bay and Langebaan Lagoon were obtained by means of a diver-operated suction-sampling device.

Length measurements were taken from the anterior tip of the carapace to the posterior edge of the telsonic somite. Exhalant siphons and uropods were excluded in every case.

TABLE 1

Code letters of the survey programmes and their geographical ranges.

Institute	*Area*	*Explanation*	*Geographical position*
UCT		*University of Cape Town*	
	SWD	South West Africa benthic survey	Cape Cross (21°S 13°E) to Orange River Mouth (28°S 16°E)
	WCD	West coast benthic survey	Orange River Mouth (28°S 16°E) to Cape Agulhas (34°S 20°E)
	LBT	Lambert's Bay benthic transect	Lambert's Bay, shore to 800 m (32°S 18°E)
	SB	Saldanha Bay benthic survey	Saldanha Bay (32°S 17°E)
	LB	Langebaan Lagoon benthic survey	Langebaan Lagoon (33°S 18°E)
	FAL	False Bay benthic survey	False Bay (34°S 18°E)
	FBY	False Bay benthic transect	False Bay, shore to 84 m (34°S 18°E)
	SST	Still Bay transect	Still Bay, shore to 200 m (34°S 21°E)
	SCD	South coast benthic survey	Cape Agulhas (34°S 20°E) to Natal border (31°S 30°E)
	KNY	Knysna estuarine survey	34°S 23°E (plankton)
	CP	Cape Peninsula shore survey	34°S 18°E
	CPR	Cape Province shore survey	Orange River Mouth (28°S 16°E) to Umtamvuna River Mouth (31°S 30°E)
NIWR		*National Institute for Water Research*	
	COD	benthic coastal survey near Durban	30°S 30°E
	BLL	grid of benthic stations off Durban	29°S 31°E
	CON	*Morrumbene estuarine survey*	Morrumbene estuary, Mozambique (23°S 35°E: plankton)
SAM		*South African Museum*	various (see text for details)
RU		*Rhodes University* (*Zoology Dept.*)	Lake St Lucia, Zululand (28°S 32°E: plankton)
PEM		*Port Elizabeth Museum*	Richards Bay, Zululand (28°S 32°E: plankton)
FISH		*Sea Fisheries Branch*	South West Africa (20°S 12°E: plankton)
BMNH		*British Museum* (*Natural History*)	Hermanus, shore (34°S 19°E)

SYSTEMATICS

Family **Bodotriidae** Scott, 1901

Diagnosis

No free telson. Pleopods (males only) with an outer process to the inner ramus—usually five pairs, but may be two or three. Mandibles narrow at base. Endopod of uropod 1- or 2-segmented. Branchial apparatus without gill-plates or supports.

Remarks

The family was divided by Hale (1944*b*) into two subfamilies according to the number of thoracic limbs bearing exopods. The Vaunthompsoniinae are characterized by having exopods on pereiopods other than the first pair and the southern African representatives of this subfamily were dealt with in the first paper in this series (Day 1975).

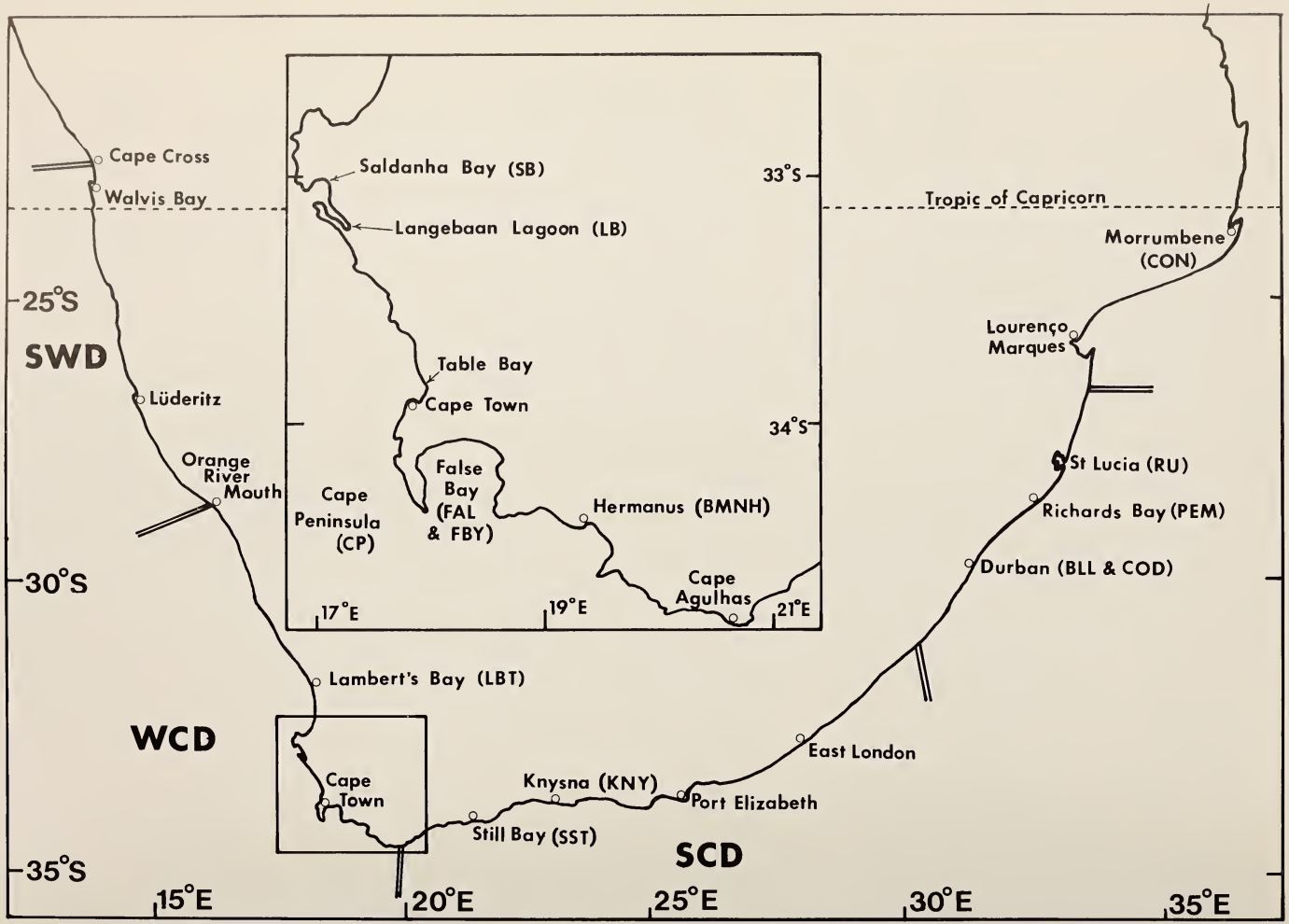

Fig. 1. Southern Africa south of 20°S:
collecting areas and corresponding code letters. Double lines indicate borders of code areas. Inset: south-western Cape.

Subfamily **Bodotriinae** Hale, 1944

Diagnosis

Bodotriidae with exopods only on the third maxilliped and first pereiopod in both sexes.

Remarks

The genera of the Bodotriinae form a fairly homogeneous and apparently natural group. The subfamily up to now has consisted of eight genera, all related morphologically and similar in general appearance. *Stephanomma* is a monotypic genus, known only from a single specimen in the West Indies, characterized by the absence of pseudorostral lobes. *Zygosiphon*, also monotypic, is known from a few specimens from Indo-China and is characterized by the pseudorostral lobes being produced laterally to accommodate the widely divergent branchial siphons. Representatives of all the other genera occur in the present collection, as well as specimens which do not fit into any known genus. Since generic boundaries are already tenuous in most cases, it is felt that less confusion will result from the erection of new genera than from the expansion of the definitions of existing ones.

A small number of individuals from Morrumbene estuary in Mozambique are in some respects similar to *Eocuma*, while in others they are quite distinct. They have been placed, rather hesitantly, in a new genus, *Mossambicuma*.

There are also some specimens of a single species in which the male has only three pairs of pleopods. Since this character is unique in the subfamily they too must be separated, and are placed in the new genus *Austrocuma*.

Representatives of *Cyclaspis carinata* Zimmer, 1921 occur in the collection. Further examination shows them to be quite atypical for the genus: the second pereiopod is 7-segmented, while the first pedigerous somite is quite clearly visible in both sexes and the endopod of the uropod is 2-segmented. A new genus, *Alticuma*, has therefore been created for them and for a second similar species found in deep water in the southern Mozambique Channel.

The *Bodotria–Iphinoe–Cyclaspis* group consists of a continuum of species which are separated into three genera on the basis of the number of free pedigerous somites and of segments of pereiopod 2 and of the endopod of the uropod. Thus *Iphinoe* has five free pedigerous somites, the second pereiopod is 6-segmented and the endopod of the uropod 2-segmented. *Cyclaspis* has four visible pedigerous somites, the second pereiopod is 7-segmented and the endopod of the uropod 1-segmented. *Bodotria* has four visible pedigerous somites, the second pereiopod is 6-segmented and the endopod of the uropod 1- or 2-segmented. But generic distinctions are not absolute, for in the females of some species of *Cyclaspis* the first pedigerous somite may be visible and in *Bodotria* the fusion of the ischium of pereiopod 2 with the basis is not always complete, so that it is sometimes difficult to say with certainty whether the limb is 6- or 7-segmented.

TABLE 2. Diagnostic characters of the genera of the Bodotriinae

	Iphinoe	*Alticuma* gen. nov.	*Zygosiphon*	*Austrocuma* gen. nov.	*Cyclaspis*	*Stephanomma*
First pedigerous somite visible?	yes	yes	yes	in ♀ only	no (except in some ovig. ♀♀)	yes
width of second pedigerous somite	moderate (♂) to wide (♀)	moderate	moderate	moderate (♂) to very wide (♀)	narrow	moderate
number of segments of pereiopod 2	6	7	7	6	7	7
number of segments of endopod of uropod	2	2	2	1	1	1
length of peduncle of uropod in relation to rami	equal or longer	longer	longer	equal	variable	much longer
length of peduncle of uropod in relation to telsonic somite	longer	longer	longer	much longer	variable	much longer
length of pseudorostral lobes	moderate to long	short to moderate	long, divergent	very short	short to very short	none
body form	slender	slender to moderate	moderate	short, flat, very wide	very variable	moderate
ornamentation	frequently middorsal carina, often serrate	variable	none	none	variable—plain, highly ornate or moderately so	none
other features of diagnostic value	ventral thoracic sternites of ♂ frequently complex	none	branchial siphons widely divergent	♂ with three pairs of pleopods	none	no pseudorostral lobes

TABLE 2. Diagnostic characters of the genera of the Bodotriinae (*Continued*)

	Mossambicuma gen. nov.	*Bodotria*	*Eocuma*	*Upselaspis*	*Cyclaspoides*
First pedigerous somite visible?	no	no	no	no	no
width of second pedigerous somite	moderate	moderate in ♂, very wide in ♀	narrow (may fuse with carapace)	wide in ♀, very narrow or under carapace in ♂	under carapace in ♀, visible laterally only in some ♂♂
number of segments of pereiopod 2	6	6	6	6	6
number of segments of endopod of uropod	1	1–2	1	2	1–2
length of peduncle of uropod in relation to rami	shorter	longer	much shorter	subequal	shorter
length of peduncle of uropod in relation to telsonic somite	shorter or subequal	much longer	much shorter	longer	much shorter
length of pseudorostral lobes	moderate	short to very short	short to moderate	short	long
body form	elongate	moderate to stout	elongate	moderate	abdomen short, carapace relatively long
ornamentation	none	often with one or more pairs of lateral carinae	usually dorsoventrally flattened and/or with lateral horns	none	carapace laterally compressed with middorsal carina
other features of diagnostic value	none	none	basis of pereiopod 1 produced to a point distally	none	third pedigerous somite under carapace at least laterally

However, the species of both *Iphinoe* and *Bodotria* are generally rather characteristic of their genera, those of *Iphinoe* usually being slender and elongate with long pseudorostral lobes and of *Bodotria* being more compact and frequently bearing one or more pairs of lateral carinae and very short pseudorostral lobes. One of the species occurring in considerable numbers in the present collection was named *Iphinoe zimmeri* by Stebbing (1910) on the basis of a single adult male. Although in external appearance and in details of the limbs it quite clearly belongs to *Iphinoe*, since the first pedigerous somite is invisible it should by rights be placed in *Bodotria*, which is plainly unsatisfactory. It is therefore considered to be *genus incertus* and is called '*Iphinoe? zimmeri*'.

The main problem in *Bodotria* seems to be less a matter of generic than of specific boundaries. Many of the numerous species are very similar to one another and may well prove to be genetic morphs rather than valid species.

Cyclaspis is a very variable genus, the carapace of some species being highly ornamented and of others quite unadorned, while the proportions of the segments of the uropods to the telsonic somite vary far more than they do in other genera. Added to this, *Cyclaspis* has a large number of species (about 80) and could profitably be split into two or more genera of roughly equal numbers. There does not, however, seem to be any satisfactory means of doing so since the ornamentation, which is the most striking polymorphic feature, does not correspond uniformly with any other obvious distinguishing characters.

Within *Cyclaspis* there is one small group of species (*subgrandis*, *tasmanica*, *longicaudata*, *gigas* and *spectabilis*) which are clearly related in a number of features, notably the unadorned, more or less spherical carapace, the long telsonic somite, the short peduncle of the uropods and the large basis of maxilliped 3. They also tend to be deep-water forms. However, these characters, which are quite distinctive in the species mentioned, are to be found to a lesser degree in some of the more typical species. As a result it would be necessary to examine representatives of a large number of species quite closely in order to decide whether, in fact, those mentioned above could satisfactorily be removed to a new genus. This could well be one of the more useful applications of numerical taxonomy.

Table 2 (see page 164) lists the diagnostic characters of the genera of the Bodotriinae, which are also keyed below.

KEY TO THE GENERA OF BODOTRIINAE

1 Second pereiopod 7-segmented (ischium not at all fused with basis).....2
– Second pereiopod 6-segmented (ischium at least partly fused with basis).....4
2 No pseudorostral lobes.....*Stephanomma* Sars, 1871
– Pseudorostral lobes widely divergent.....*Zygosiphon* Calman, 1905
– Pseudorostral lobes normal, anteriorly directed.....3
3 First pedigerous somite visible at least dorsally in male, dorsally and laterally in female; endopod of uropod 2-segmented.....*Alticuma* gen. nov.
– First pedigerous somite never visible in male, sometimes visible dorsally in ovigerous female; endopod of uropod 1-segmented.....*Cyclaspis* Sars, 1865

4 First pedigerous somite visible in both sexes; endopod of uropod 2-segmented; male with five pairs of pleopods ..... *Iphinoe* Bate, 1856
– First pedigerous somite visible in female only; endopod of uropod 1-segmented; male with three pairs of pleopods ..... *Austrocuma* gen. nov.
– First pedigerous somite visible in neither sex; endopod of uropod 1- or 2-segmented; male with five pairs of pleopods 5
5 Gut coiled; pedigerous somites 2 and 3 incorporated under carapace at least dorsally in both sexes ..... *Cyclaspoides* Bonnier, 1896
– Gut straight; pedigerous somite 3 always free and visible in both sexes; pedigerous somite 2 visible in female, sometimes fused with or incorporated under carapace in male 6
6 Peduncle of uropods no more than half length of rami 7
– Peduncle of uropods equal in length to, or longer than, rami* 8
7 Third segment of antenna 1 longest; basis of pereiopod 1 not distally produced *Mossambicuma* gen. nov.
– Third segment of antenna 1 no longer than first; basis of pereiopod 1 distally produced to a point ..... *Eocuma* Marcussen, 1894
8 Lateral carinae frequently present on carapace; second pedigerous somite always visible in both sexes (often as wide as deep in female, half as wide as deep in male); peduncle of uropod much longer than rami* ..... *Bodotria* Goodsir, 1843
– Carapace without lateral carinae; second pedigerous somite free in female (about half as wide as deep), incorporated under carapace in male or else very narrow; peduncle of uropod subequal in length to rami ..... *Upselaspis* Jones, 1955

*Peduncle of uropod subequal in length to rami in *Iphinoe? zimmeri.*

KEY TO THE SOUTHERN AFRICAN BODOTRIINAE

Taxonomically accurate keys to both genera and species are often difficult for the inexperienced to follow. Since such keys also frequently require examination of adult animals of both sexes and details of appendages which may be missing, the following key is provided for convenience. It should be noted, however, that although this key will separate all species found to date in southern African waters, it will *not* necessarily distinguish them from species in other areas. The key is based almost entirely on characters of those parts of the body that are least likely to be damaged or missing, so that although it can be used to identify damaged animals, it is *not* as rigorous as the keys to individual genera and species, which should always be consulted for final identification.

1 Carapace with one or more pairs of longitudinal ridges (carinae) or depressions lateral to midline (Figs 4A, 26A, 41A) 2
– Carapace with paired carinae (Fig. 15A), horns (Fig. 5B) or depressions (Fig. 6A) lateral to midline, but none running longitudinally 15
– Carapace without paired carinae, horns or depressions lateral to midline (Figs 2A, 13A), although dorsal outline may undulate (Fig. 37A) 18
2 Carapace very strongly depressed dorsoventrally, lateral carina forming plate-like edge and produced anterolaterally to form a pair of rounded projections visible in dorsal view *Eocuma winri* (Fig. 4)
– Carapace not strongly depressed dorsoventrally; carinae neither platelike nor forming horns 3
3 Carapace with one or more pairs of shallow longitudinal grooves or depressions but lacking lateral carinae 4
– Carapace with no more than one pair of longitudinal depressions; at least one pair of lateral carinae present (Fig. 12A) 5
4 All five pedigerous somites visible dorsally; a number of shallow longitudinal grooves present on either side of carapace ..... *Iphinoe crassipes* (Figs 26–27)

– Only four pedigerous somites visible dorsally; a single shallow longitudinal groove present on either side of carapace ..... *Mossambicuma elongatum* (Figs 10–11)

5 Two pairs of lateral carinae on at least part of carapace (Fig. 43A, N) (lower one may be secondary, forming ventral edge of continuous midlateral depression (Fig. 43A) at least anteriorly) 6

– A single pair of lateral carinae on carapace (Fig 45A, E); midlateral depression, if present, not bounded anteroventrally by continuous secondary carina (Fig. 46A, I) 9

6 Dorsal parts of free pedigerous somites laterally compressed, forming narrow plates *Bodotria clara* (Figs 34–35)

– Free pedigerous somites not compressed, not forming narrow plates dorsally 7

7 Carapace more than twice as long as deep ..... *Bodotria tenuis* (Fig. 42)

– Carapace less than twice as long as deep 8

8 Carapace of female wider than long, of male less than one and a quarter times as long as wide; carpus of pereiopod 1 less than three times as long as wide .. *Bodotria falsinus* (Fig. 43)

– Carapace of both male and female at least one and a half times as long as wide; carpus of pereiopod 1 at least four times as long as wide ..... *Bodotria australis*

9 Carapace about as wide as long and more than one and a half times as wide as deep, making animal conspicuously flat above; male with three pairs of pleopods ..... *Austrocuma platyceps* (Fig. 12)

– Carapace longer than wide and less than one and a half times as wide as deep; male with five pairs of pleopods 10

10 Second pedigerous somite carinate laterally ..... *Bodotria montagui* (Fig. 41)

– Second pedigerous somite not carinate laterally 11

11 Distal prolongation of basis of maxilliped 3 pointed, reaching well beyond insertion of carpus on merus; carapace distinctly more than twice as long as deep; lateral carina present on anterior part of carapace only ..... *Bodotria glabra*

– Distal prolongation of basis of maxilliped 3 rounded, hardly or not reaching insertion of carpus on merus (Fig. 39E); carapace no more than twice as long as deep; lateral carinae variable 12

12 Pedigerous somites 4 and 5 elevated to a point dorsally (more distinct in female than male—Figs 44A, E) 13

– Pedigerous somites 4 and 5 not elevated dorsally in either sex (Fig. 46A, I) 14

13 Lateral carina reaching posterior border of carapace with a longitudinal row of rounded depressions below ..... *Bodotria vertebrata vertebrata* (Fig. 44)

– Lateral carina not reaching posterior border of carapace; no rounded depressions below *Bodotria vertebrata semicarinata* (Fig. 45)

14 Second pedigerous somite strongly elevated to a point dorsally in female and juvenile; lateral carina sinuous, most evident along midregion of carapace; integument often strongly calcified ..... *Bodotria elevata* (Figs 39–40)

– Second pedigerous somite never elevated dorsally in either sex; lateral carina straight, evident along almost entire length of carapace; integument usually silky and never strongly calcified ..... *Bodotria serica* (Fig. 46)

15 Carapace with a pair of oblique ridges, depressions or slashes running from middorsal line towards ventrolateral edge (Figs 15A, 32A) 16

– Carapace without oblique irregularities (Fig. 6A) 17

16 Caraplace slashed by transverse groove ..... *Cyclaspis scissa* (Fig. 32)

– Carapace with raised transverse ridge, faint in adult male, very strong in females and young males ..... *Alticuma bellum* (Figs 15–16)

17 Single pair of acutely pointed lateral horns on carapace; integument tuberculate and hairy *Eocuma aculeatum* (Fig. 5)

– Anterolateral edges of carapace produced to level of pseudorostrum to form blunted, horn-like projections; integument slightly wrinkled ..... *Eocuma* sp (Fig. 6)

18 Integument strongly pitted or rugose 19

– Integument smooth (faint pitting or reticulations may be visible at high magnifications) .. 20

19 Integument, especially of carapace, very rugose; second pedigerous somite not narrower than third ..... *Bodotria magna* (Fig. 36)

– Integument strongly pitted; second pedigerous somite narrower than third ..... *Eocuma foveolatum* (Figs 2–3)

20 Pseudorostral lobes not meeting in front of eyelobe (Fig. 31A).....21
– Pseudorostral lobes meeting in front of eyelobe, even if only for a very short distance (Figs 7B, 47C).....22
21 Dorsal outline of carapace undulating; articulatory peg present between carapace and first free pedigerous somite.....*Bodotria nitida* (Figs 37–38)
– Dorsal outline of carapace smoothly arched; no articulatory peg between carapace and first free pedigerous somite.....*Cyclaspis australora* (Figs 30–31)
22 Carapace at least two and a half times as long as deep.....23
– Carapace less than two and a half times as long as deep.....24
23 Carapace three times as long as deep, circular in cross-section, not serrate middorsally *Iphinoe stebbingi* (Figs 17–18)
– Carapace nearer two and a half times as long as deep, elliptical in cross-section, serrate middorsally.....*Iphinoe producta* (Fig. 21)
24 Pereiopod 2 less than three-quarters length of pereiopod 3....*Iphinoe africana* (Figs 19–20)
– Pereiopod 2 more than three-quarters length of pereiopod 3.....25
25 Middorsal carina evident; carapace elliptical in cross-section (Figs 9C, 13A, D).....26
– Middorsal carina defined poorly or not at all; carapace almost rounded in cross-section (Fig. 7A–B).....28
26 Second pereiopod 7-segmented.....*Alticuma carinatum* (Figs 13–14)
– Second pereiopod 6-segmented.....27
27 Middorsal carina serrate; first pedigerous somite visible in both sexes..... *Iphinoe dayi* (Figs 22–23)
– Middorsal carina not serrate; first pedigerous somite not visible in either sex..... *Cyclaspoides pellucidus* (Figs 8–9)
28 Carapace globose, vaulted dorsally, less than one and a half times as long as deep..... *Cyclaspis spectabilis* (Fig. 33)
– Carapace not globose, not vaulted dorsally, more than one and a half times as long as deep (Figs 7A, 23A).....29
29 Eye absent.....*Upselaspis caparti* (Fig. 7)
– Eye present.....30
30 Prolongation of basis of maxilliped 3 reaching level of insertion of propodus on carpus (Fig. 24F).....31
– Prolongation of basis of maxilliped 3 reaching merus (Fig. 28D).....32
31 Prolongation of basis of maxilliped 3 a quarter its total length.*Iphinoe fagei* (Figs 24–25)
– Prolongation of basis of maxilliped 3 a third its total length.....*Iphinoe senegalensis*
32 Merus and carpus of maxilliped 3 strongly flattened, carpus and propodus widely inserted on preceding segments.....*Iphinoe capensis* (Fig. 29)
– Merus and carpus of maxilliped 3 not strongly flattened, carpus and propodus inserted over little more than half width of preceding segments (Fig. 28D, L).....33
33 Basis of maxilliped 3 less than four times as long as wide, one and a half times length of remaining segments together.....*Iphinoe truncata* (Fig. 28)
– Basis of maxilliped 3 six times as long as wide, twice length of remaining segments together *Iphinoe ? zimmeri* (Figs 47–48)

Eocuma Marcussen, 1894

Generic diagnosis

Carapace frequently with lateral horns and/or very distinct lateral carinae, almost always wider than deep. First pedigerous somite always invisible, second frequently fused with carapace. Distal prolongation of maxilliped 3 large and stout, merus frequently greatly expanded. Basis of pereiopod 1 distally produced beyond insertion of ischium. Second pereiopod 6-segmented. Peduncle of uropod much shorter than telsonic somite or rami. Endopod of uropod 1-segmented.

Type species

E. hilgendorfi Marcussen, 1894, from Japan.

Remarks

The genus, consisting of 22 species, is well known. In almost all cases its species can readily be distinguished by distinctive lateral horns and/or carinae. However, one of the new species, *E. foveolatum*, is in most respects quite clearly a member of the genus, yet has neither horns nor carinae in either sex, thus resembling the females of *E. dimorphum* Fage, 1928.

Only a single specimen of *Eocuma* has previously been described from South Africa (Stebbing 1910).

Distribution of Eocuma

Members of the genus are confined to the warmer waters of the eastern hemisphere, being distributed mainly round the coast of Africa (12 species) and Indochina (9 species); 1 species occurs in Australian and 2 in Japanese waters; 3 of the African species are here described as new. Most species in the genus are found in shallow waters less than 50 m in depth, and a few are found as deep as about 100 m. The greatest recorded depth for the genus is vastly increased by the presence of *E. aculeatum* sp. nov. from 550 m off Natal.

KEY TO THE SPECIES OF *EOCUMA*

1 Carapace dorsoventrally flattened, entire lateral border carinate 2
– Carapace rounded or dorsoventrally flattened, but carinate for less than half its length, or not at all 13
2 Carapace in dorsal view with at least one pair of distinct lateral horns or projections 3
– Carapace in dorsal view without distinct lateral horns, but edge may be incised or bear a pair of small teeth 10
3 Second pedigerous somite fused with carapace, unsutured dorsally ..... *dollfusi* Calman, 1907*b*—Mediterranean and Morocco to northern France
– Second pedigerous somite free or sutured dorsally 4
4 Carapace without paired dorsal ridges 5
– Carapace with paired dorsal ridges on posterior half at least 8
5 Basis of pereiopod 1 almost as long as rest of limb ..*productum* Calman, 1907*a*—Indo-China
– Basis of pereiopod 1 about two-thirds length of rest of limb 6
6 In dorsal view pseudorostrum narrow, carapace tapering smoothly anteriorly from lateral horns in a straight line; horns laterally directed, tips forming widest part of carapace *longicorne* Calman, 1907*a*—Suez
– In dorsal view pseudorostrum wide, carapace rounded anterior to lateral horns; horns anteriorly directed, tips slightly anterior to widest part of carapace 7
7 Pereiopod 2 shorter than basis of pereiopod 3; second and third segments of antenna 1 subequal in length ..... *winri* sp. nov.
– Pereiopod 2 longer than basis of pereiopod 3; second segment of antenna 1 about half length of third segment ..... *taprobanicum* Calman, 1904*a*—Ceylon
8 Eye with at least three corneal lenses ..... *hilgendorfi* Marcussen, 1894—Japan
– Eye without lenses 9
9 Carpus of perieopod 1 more than twice length of dactyl ..... *stelliferum* Calman, 1907*a*—Indo-China
– Carpus of pereiopod 1 much less than twice length of dactyl ..... *latum* Calman, 1907*a*—Mediterranean, Indo-China, Japan

10 Carapace smooth dorsally with no longitudinal ridges.....*kempi* Kurian, 1954—India
– Carapace with at least one pair of longitudinal ridges.....11
11 Dactyl and propodus of pereiopod 1 of equal length....*cadenati* Fage, 1928—West Africa
– Dactyl of pereiopod 1 little more than half length of propodus.....12
12 Lateral carina of carapace produced anteriorly to form two obtusely rounded lobes *amakuense* Gamô, 1967—Japan
– Lateral carinae incised anteriorly forming a pair of slightly angular lobes..... *cochlear* LeLoeuff & Intes, 1972—West Africa
13 Two pairs of horns forming pointed anterolateral projections..... *calmani* Fage, 1928—West Africa
– One pair of horns laterally or none.....14
14 Horns short, anteriorly directed, reaching anterior tip of pseudorostrum.....15
– Horns laterally directed, not reaching level of pseudorostrum anteriorly, or absent.....16
15 Horns well developed, acutely pointed.....*sarsi* (Kossmann, 1880)—Red Sea
– Horns poorly developed, very short.....*Eocuma* sp.—South Africa
16 Ischium of maxilliped 3 subequal in length to maximal length of merus, or longer.....17
– Ischium of maxilliped 3 no more than half maximal length of merus.....18
17 Dactyl of pereiopod 1 half length of propodus; peduncle of uropod nearly a third length of rami.....*affine* Calman, 1904*a*—India
– Dactyl of pereiopod 1 longer than propodus; peduncle of uropod nearly quarter length of rami.....*agrion* Zimmer, 1914—Australia
18 Basis of pereiopod 1 equal in length to next three segments together; horns present..... *travancoricum* Kurian, 1951–India
– Basis of pereiopod 1 considerably longer than next three segments together; horns present or absent.....19
19 Carpus of pereiopod 1 longer than ischium and merus together; horns present.....20
– Carpus of pereiopod 1 shorter than ischium and merus together; horns present or absent.21
20 Integument smooth; ischium of maxilliped 3 wider than long..... *lanatum* LeLoeuff & Intes, 1972—West Africa
– Integument tuberculate; ischium of maxilliped 3 longer than wide.....*aculeatum* sp. nov.
21 Maximal length of merus of maxilliped 3 little less than twice length of ischium; horns present.....*ferox* (Fischer, 1872)—Mediterranean
– Maximal length of merus of maxilliped 3 nearly three times length of ischium; horns present or absent.....22
22 Tip of basis of pereiopod 1 reaching end of ischium or just beyond; ♂ with horns, ♀ without; pereiopod 2 of ♀ less than half length of pereiopod 3..... *dimorphum* Fage, 1928—West Africa
– Tip of basis of pereiopod 1 reaching along a third length of merus; ♂ and ♀ without horns; pereiopods 2 and 3 of ♀ subequal in length.....*foveolatum* sp. nov.

Eocuma foveolatum sp. nov.

Figs 2–3

Records

			adult ♂	sub. adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
LB	33°S 18°E	5 m	6	5	1	6	2	4	24	13*
FAL	34°S 18°E	15–60 m	5	5	4	4	3		21	20
SST	34°S 21°E	80 m	1	2			3		6	1
SCD	34°S 23°E–33°S 25°E	42–44 m	1			2	2	1	6	3

*Five samples collected by plankton net.

Holotype

Ovigerous female, in the South African Museum, SAM–A15492, collected during the UCT benthic survey, 5 December 1962. Type locality: 44 m, off East London (33°53′S 25°48′E). UCT station number SCD 378L.

Description

Ovigerous female, holotype, length 4,8 mm. Integument marked by fine reticulations interspersed with deep pits, particularly on sides of carapace, and fine hairs causing small particles of debris to stick to entire animal. Carapace (Fig. 2A) smoothly rounded, one and a half times as long as deep, with no trace of lateral horns. Antennal notch (Fig. 2B) small, anterolateral angle obtuse, defined by a small, sharp tooth. Carapace in dorsal view (Fig. 2C) almost oval, not much longer than wide, lacking middorsal carina; middorsal line marked by a shallow indentation. Pseudorostral lobes short, truncate anteriorly. Eyelobe eyeless, rounded, with a few scattered tubercles on surface.

First pedigerous somite invisible. second well defined and not fused with carapace; third and fourth much less elevated dorsally than second, bearing rounded sideplates. Carapace twice length of free pedigerous somites. cephalothorax shorter than first five abdominal somites together. Abdomen very elongate, cylindrical.

Antenna 1 (Fig. 2D) relatively short and stout. Flagellum (Fig. 2E) very short, 1-segmented, with two aesthetascs; accessory flagellum minute, 1-segmented.

Maxilliped 3 (Fig. 2F) stout, basis strongly flexed at mid-point, part distal to point of flexure subequal in length to rest of limb. Distal prolongation long and narrow, reaching articulation of carpus and merus. Merus three times length of ischium, expanded, distal prolongation reaching distal tip of carpus. Carpus, propodus and dactyl subequal in length, cylindrical.

Pereiopod 1 (Fig. 2G) stout, basis slightly longer than remaining segments together, distal projection reaching beyond distal tip of ischium. Distal segments fairly stout, all of similar lengths.

Pereiopod 2 (Fig. 2H) long, 6-segmented; basis subequal in length to rest of limb. Merus and carpus subequal, propodus half length of dactyl.

Pereiopods 3 (Fig. 2I) to 5 similar, dactyl extremely small and unarmed.

Telsonic somite two-thirds length of preceding one, not produced between uropods. Peduncle of uropod (Fig. 2J) very short, as wide as long, little more than half length of telsonic somite, unarmed. First segment of exopod expanded dorsally beyond insertion of second, less than half length of second, armed with a small spine on outer edge. Second segment armed with two long, fine spines on inner edge, seven short spines on outer edge and two complex hooked setae terminally. Endopod 1-segmented, bearing six fine plumose setae on inner edge and one very stout spine terminally.

Adult male, paratype, length 6,7 mm. As female, except as follows: carapace (Fig. 3A) smoothly ovoid, nearly twice as long as deep, slightly flattened dorso-

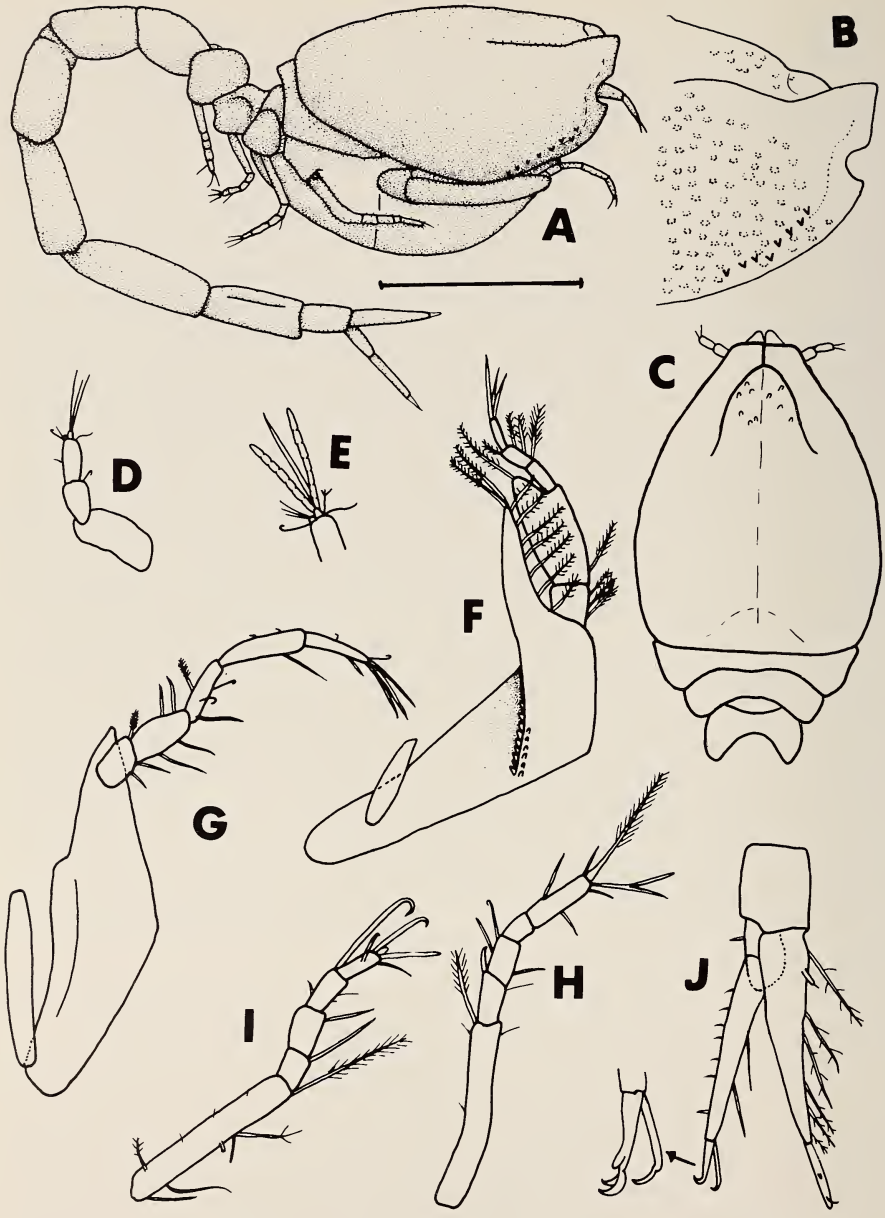

Fig. 2. *Eocuma foveolatum* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Detail of distal tip of antenna 1. F. Maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Uropod.

Scale line = 1 mm for A, C; 0,5 mm for B, D, F–J; 0,25 mm for E.

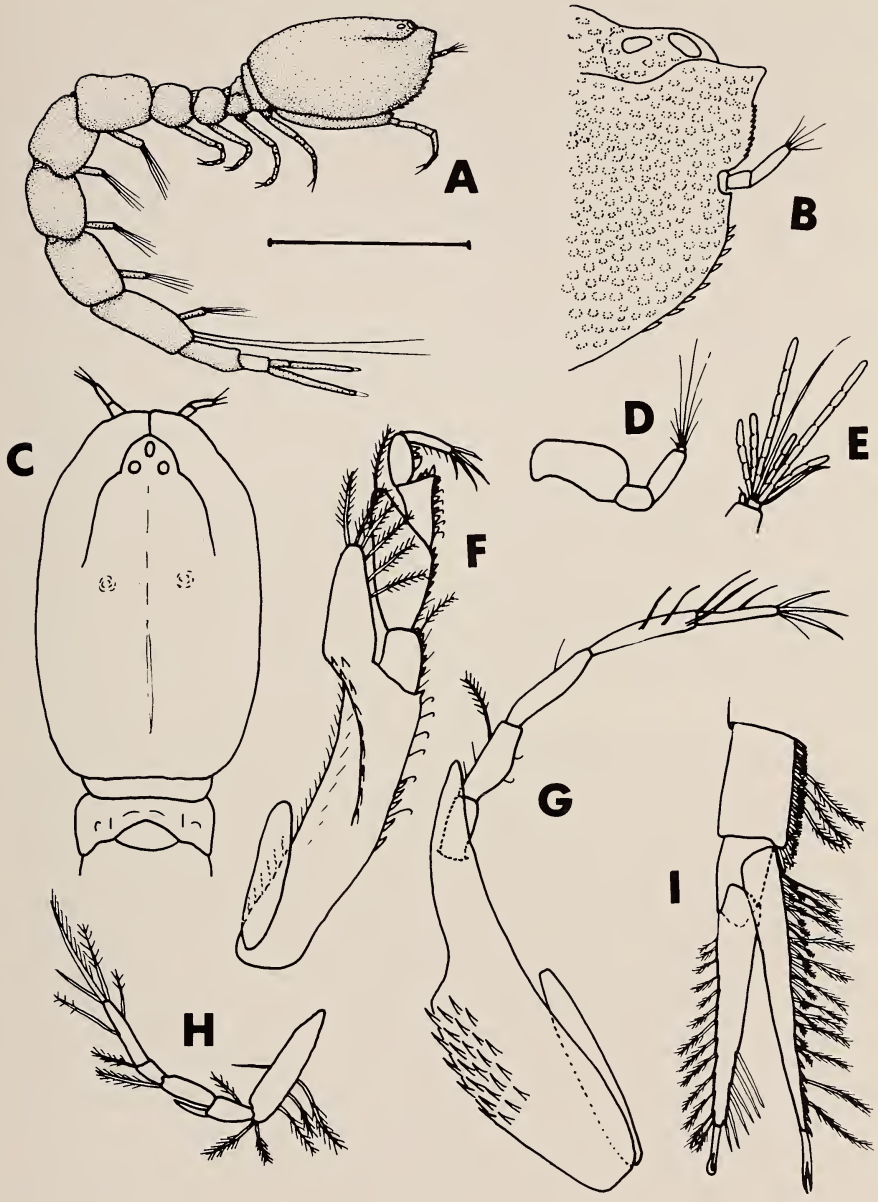

Fig. 3. *Eocuma foveolatum* sp. nov.

Adult male, paratype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Detail of distal tip of antenna 1. F. Maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Uropod.

Scale line = 2 mm for A; 1 mm for C, H; 0,5 mm for B, D, F–G, I; 0,25 mm for E.

ventrally, integument with pits even more obvious than in the female. Antennal notch (Fig. 3B) very small, as is anterolateral angle. Carapace narrower in dorsal view (Fig. 3C), one and a half times as long as wide, marked middorsally by faint indentation with a single pair of rounded depressions on either side about midway along length. Eyelobe narrower, bearing three large, clear lenses. Abdominal sideplates defined ventrally.

Flagellum of antenna 1 (Fig. 3D–E) with two long and four short aesthetascs. Basis of maxilliped 3 (Fig. 3F) not flexed at midpoint, distal prolongations of basis and merus broader, carpus and propodus also somewhat expanded. Basis of pereiopod 1 (Fig. 3G) with numerous sharp spines near midventral edge. Basis of pereiopod 2 (Fig. 3H) slightly shorter. Telsonic somite relatively smaller and narrower, uropods (Fig. 3I) more slender and much more strongly armoured. Peduncle longer than wide, with three long plumose setae and numerous short, blunt spines on inner edge. Exopod with thirteen plumose setae on outer edge, six fine spines distally on inner edge and a single stout complex seta terminally. Endopod with thirteen long plumose setae and seventeen shorter blunter spines on inner edge, followed by six or seven scale-like serrations distally, and a strong complex spine terminally.

Length

Adult male	6,7–7,5 mm
Ovigerous female	4,8–6,4 mm

Remarks

E. foveolatum is clearly distinguished from most other members of the genus by the complete absence of lateral horns or flattening of the carapace in both sexes. However, due to the structure of the third maxillipeds, the basis of pereiopod 1, and the uropods, it is readily accommodated in the genus. It is most closely allied to *E. dimorphum* Fage, 1928 from west Africa, in which the carapace of the female is smooth, although the male possesses a pair of lateral horns. Added to this, in both sexes of *E. dimorphum* the carapace is longer, the antennal notch poorly defined, the second pereiopod is much smaller than the third, and the merus of maxilliped 3 and the basis of pereiopod 1 are shorter. Adult females of *E. dimorphum* reach a size of 8 mm, whereas in *E. foveolatum*, the largest is 6,4 mm. The variable nature of the lateral horns in *E. dimorphum* links *E. foveolatum* with the more typical members of the genus.

As a matter of interest, it was probably an individual of this species which Stebbing (1910) referred to as *Cyclaspis* sp, saying that it was similar in several respects to *C. spectabilis*, but hairy and 'clogged with extraneous matter'.

Distribution

Apparently endemic to the warmer waters of the south and south-western coasts of South Africa, being found between 5 and 80 m from Langebaan Lagoon to East London. A fairly common species in shallow, sheltered waters

of the south-western Cape, rarer in other areas. Numerically it constitutes a little over 1 per cent of the individuals in the collection.

Eocuma winri sp. nov.

Fig. 4

Records

NIWR 30°S 30°E–27°S 32°E 37–80 m 1 adult ♂, 1 ovig. ♀, 3 ♀♀, 1 manca (5 records)

Holotype

Adult male, in the South African Museum, SAM–A15493, collected by the NIWR, 4 September 1975. Type locality: 50 m, off the Natal coast (27°33′S 32°41′E). NIWR station number MN 75/24 G_2.

Description

Adult male, holotype, length 11,6 mm. Integument white, shiny, faintly reticulate, brittle and opaque on carapace, less so on thorax and abdomen. Carapace (Fig. 4A) strongly depressed dorsoventrally, lateral edges marked by acute carina bearing single pair of forward-pointing blunt horns. No antennal notch or anterolateral angle. In dorsal view (Fig. 4B), lateral horns mark widest part of carapace. Pseudorostral lobes wide, meeting for some distance in front of bluntly rounded eyelobe. Eyelobe with five large clear lenses. Middorsal carina faint on carapace, wanting posteriorly.

Second pedigerous somite narrow, immovably attached to carapace; third to fifth with sprays of plumose setae projecting dorsally in midline. Carapace slightly more than twice as long as deep, one and a half times length of free pedigerous somites. Cephalothorax slightly shorter than abdomen. Sideplates of abdominal somites strongly defined ventrally.

Antenna 1 (Fig. 4C) of moderate length, basal segment wide and roundly geniculate. Next two segments subequal in length. Flagellum 1-segmented with two aesthetascs. Accessory flagellum small, 1-segmented.

Maxilliped 3 (Fig. 4D) large and stout. Basis flattened, relatively short, almost twice length of rest of limb, serrated on inner edge. Distal prolongation strongly developed, reaching distal tip of carpus. Ischium large, longer than merus. Merus expanded, distally reaching articulation of carpus and propodus. Carpus slightly expanded towards midline. Propodus stout and dactyl slender.

Pereiopod 1 (Fig. 4E) elongate, basis short, slightly longer than ischium, merus and carpus together, with blunt distal projection reaching beyond tip of ischium. Ischium short, half length of merus. Carpus, propodus and dactyl very long, subequal.

Pereiopod 2 (Fig. 4F) minute, 6-segmented. Basis only slightly longer than subequal merus and carpus together. Propodus and dactyl stout, subequal in length.

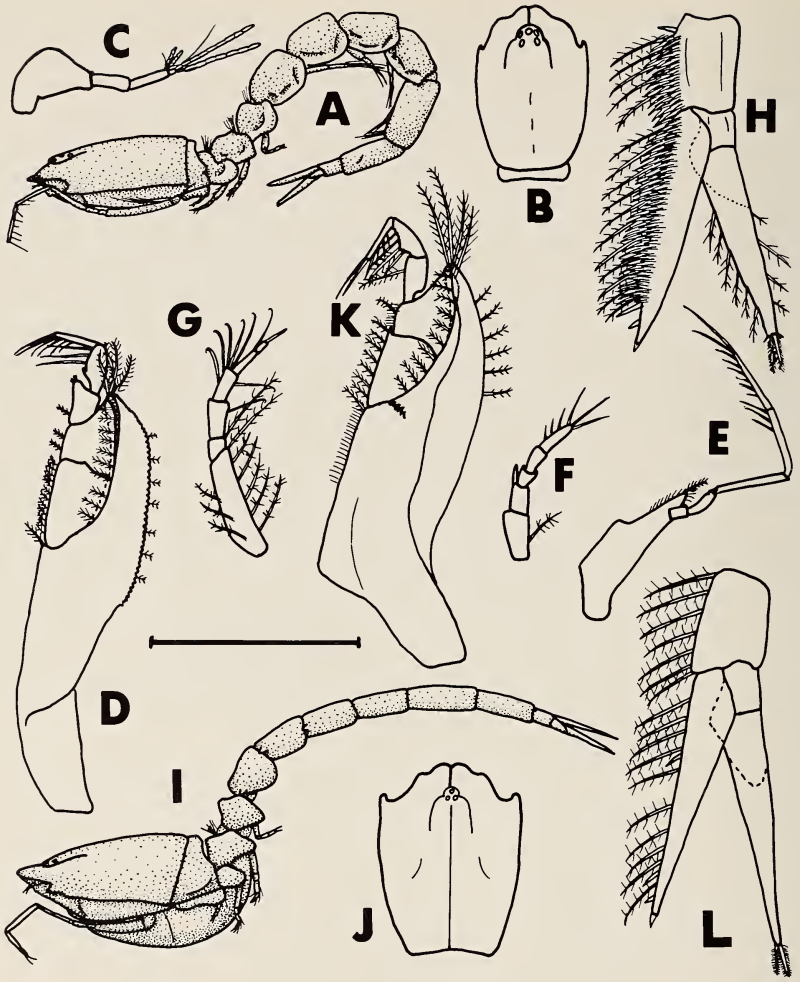

Fig. 4. *Eocuma winri* sp. nov.

Adult male, holotype, A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Uropod. Ovigerous female. I. Lateral view. J. Dorsal view of carapace. K. Maxilliped 3. L. Uropod. Scale line = 4 mm for A, B, I–J; 2 mm for E; 1 mm for D, G–H, K–L; 0,5 mm for C, F.

Pereiopods 3 (Fig. 4G) to 5 similar, basis of pereiopod 3 longest and of pereiopod 5 shortest. Basis and carpus highly setose.

Telsonic somite slightly shorter than preceding one, twice as long as wide, not produced between uropods. Peduncle of uropod (Fig. 4H) short and very stout, less than half length of telsonic somite with five plumose setae and numerous serrate spines in several rows on inner edge. Endopod about two

and a half times length of peduncle, 1-segmented, with eleven plumose setae and numerous serrate spines in several rows on inner edge and a single short, blunt spine terminally. First segment of exopod about a quarter length of second, unarmed; second armed with six plumose setae on inner edge, four on outer edge and two stout ones terminally.

Ovigerous female, length 11,9 mm (slightly damaged), from 80 m off the Natal coast. As male, except as follows: carapace (Fig. 4I) slightly more vaulted posteriorly and wider dorsally (Fig. 4J). Eyelobe smaller and bearing three lenses. Middorsal carina evident on carapace and all subsequent somites except the last. Second pedigerous somite wider, third very small, visible laterally as small flattened sideplate only. Abdominal somites much more slender, cylindrical.

Flagellum of first antenna 2-segmented. Basis of maxilliped 3 (Fig. 4K) very stout, relatively shorter. Distal projection of pereiopod 1 shorter. Pereiopods 3 to 5 less setose. Peduncle of uropod (Fig. 4L) with seven plumose setae in one row on inner edge. Rami slightly longer, second segment of exopod unarmed except for two terminal spines. Endopod with ten plumose setae in one row on inner edge.

Length

Adult male	11,6 mm
Ovigerous female	11,9 mm

Remarks

This species closely resembles *E. taprobanicum* Calman, 1904*a* from Ceylon, and the two may prove to be synonymous. *E. winri* differs from Calman's figures of *E. taprobanicum* in the narrower carapace of the female, the less well-developed lateral horns and the shorter basis of perieopod 1. In particular, pereiopod 2 is much smaller, the basis and merus together being shorter than the rest of the limb and the distal spine on the merus is shorter and weaker. The rami of the uropods are slightly shorter and the first segment of the endopod relatively larger. The differences are not considerable and these individuals may be representatives of a single species occurring from Natal to the tropical Indian Ocean and varying slightly from one end of the range to the other.

Distribution

At present known from the type locality and its vicinity, from 37 to 80 m off the Natal coast. With only six specimens known it is numerically insignificant in comparison with the total number of specimens in the collection, but is fairly common in the Natal material, representing almost 5 per cent of the individuals from this region.

Eocuma aculeatum sp. nov.

Fig. 5

Records

SAM 27°S 32°E 550 m 1 manca

Holotype

Manca, unique, in the South African Museum, SAM–A15491, collected by the South African Museum, 22 May 1974. Type locality: 550 m, in the southern Mozambique Channel (27°59′S 32°40′E). *Meiring Naude* station number SM 86.

Description

Manca, *holotype*, length 6,7 mm. Integument roughened by numerous small tubercles and hairs, especially on cephalothorax and first three abdominal somites. Carapace (Fig. 5A) nearly twice as long as deep, oval in lateral outline, with a single pair of well-developed lateral horns about a third of distance from anterior tip. Pseudorostral lobes (Fig. 5B) rounded, meeting for short distance in front of rounded, eyeless eyelobe. Middorsal line very slightly evident on carapace, not at all behind this.

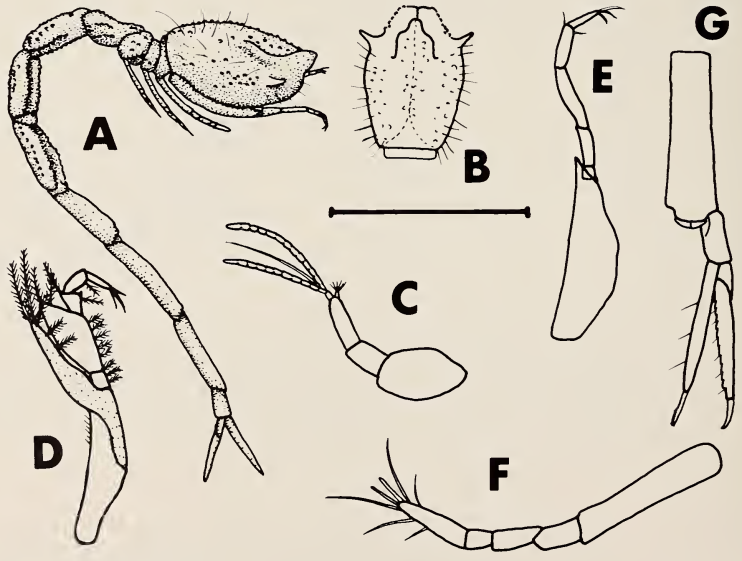

Fig. 5. *Eocuma aculeatum* sp. nov.

Manca, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Telsonic somite and uropod.

Scale line = 2 mm for A–B; 1 mm for D–E, G; 0,25 mm for C, F.

Free thoracic somites together two-thirds length of carapace; second pedigerous somite very narrow but not fused with carapace; third narrow, fourth and fifth with some tubercles, each longer than preceding one. Abdomen very long and slender, twice length of cephalothorax; first three somites tuberculate, a row of tubercles running along the length down each side forming a ventrolateral ridge; last three somites unadorned, slender and translucent. Limbs all covered with very fine detritus.

Antenna 1 (Fig. 5C) of moderate length, first segment stout, twice width of and subequal in length to next two segments. Flagellum 1-segmented with two aesthetascs; accessory flagellum small, 1-segmented.

Basis of maxilliped 3 (Fig. 5D) slender, distal prolongation long and narrow, reaching articulation of merus and carpus distally. Ischium small, merus very long and stout, distally produced to articulation of carpus and propodus. Carpus small, very slightly widened distally.

Pereiopod 1 (Fig. 5E) of moderate length, basis fairly stout, subequal in length to rest of limb, distal point reaching beyond tip of ischium. Merus and propodus subequal in length, carpus longer.

Pereiopod 2 (Fig. 5F) long and slender, 6-segmented. Merus and carpus subequal in length, twice as long as propodus. Dactyl fairly long, subequal in length to carpus and propodus together, armed with a few small spines distally.

Telsonic somite (Fig. 5G) more than three times as long as wide, slightly shorter than uropods, very slightly produced between uropods and wider posteriorly. Peduncle of uropod about twice as long as wide, less than half length of rami, unarmed. First segment of exopod less than a third length of second, unarmed; second slender, serrations on inner margin interspersed with a few very fine setae and a single terminal spine. Endopod with three very fine setae on inner margin and one stout serrate seta terminally.

Length

Manca 6,7 mm

Remarks

The specimen is the only one known from southern Africa in which the carapace bears a pair of acutely pointed lateral horns and yet lacks lateral carinae. It is unique in the genus in the presence of long hairs and tubercles on the integument. Although it is not normally acceptable to describe a new species on the basis of a single immature specimen, there are several good reasons for doing so in this case. Firstly, very little more material is likely to become available from deep waters off the eastern seaboard. Secondly, the specimen is quite distinct from all other members of the genus in the adornment of the integument, is in a good state of preservation, and it should not prove difficult to match up adults of the same species at a later date. Thirdly, its presence adds considerably to the range of depths recorded for the genus.

Distribution

At present known only from the type locality.

Eocuma sp.

Fig. 6

Eocuma sarsi: Stebbing, 1910: 414.

Records

SAM 32°S 28°E 56 m 1 subadult male. *Pieter Faure* station number SAM–A590.

Remarks

Stebbing (1910) identified this specimen as *E. sarsi* (Kossmann, 1880), saying that 'the proportions agree well with Kossmann's figure', but giving no figure or description himself. The author has re-examined the specimen, and perhaps due to the ravages of time, the external features no longer correspond well with either Stebbing's (1913) or Calman's (1904*a*) figures. In fact, it is dissimilar enough to suspect that it does not belong to *E. sarsi*. Since it is the only individual, and in a poor state of preservation, it would be unwise to refer it to a particular species. It is shown in Figure 6, and a very brief description is given below.

The carapace (Figs. 6A, C) is extremely irregular, being considerably narrower dorsally and widening out quite abruptly ventrally. The lateral horns are ill-defined, being merely blunt protrusions reaching the level of the pseudorostrum on either side. The basis of maxilliped 3 (Fig. 6F) is very much produced distally, and the merus extremely large, being little less than half as long as the basis. The distal tip of the basis of pereiopod 1 (Fig. 6G) reaches about two-thirds along the length of the merus. The four distal segments of pereiopod 2 (Fig. 6H) are sub-equal in length; pereiopod 3 (Fig. 6I) appears to be 6-segmented. The peduncle of the uropod (Fig. 6J) is not much shorter than the telsonic somite.

Upselaspis Jones, 1955

Generic diagnosis

First pedigerous somite not visible, second visible in females and some males. Second pereiopod 6-segmented. Endopod of uropod 2-segmented, peduncle subequal in length to rami.

Type species

Upselaspis caparti (Fage, 1951) (as *Cyclaspoides caparti*). The genus is monotypic.

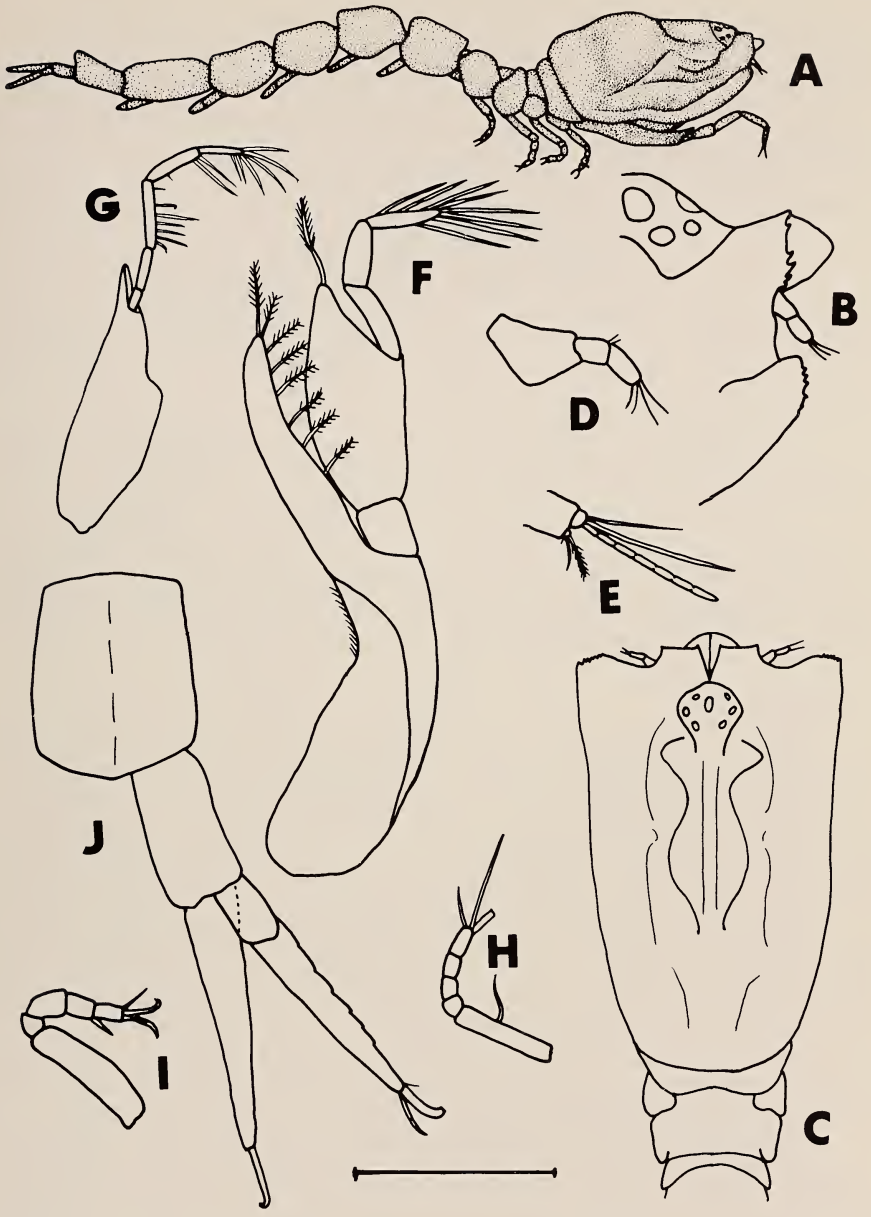

Fig. 6. *Eocuma* sp.

Subadult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Detail of distal tip of antenna 1. F. Maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Telsonic somite and uropod.

Scale line = 2 mm for A; 1 mm for C, G–I; 0,5 mm for B, D, F, J; 0,25 mm for E.

Upselaspis caparti (Fage, 1951)

Fig. 7

Cyclaspoides caparti Fage, 1951: 5–8, figs 2–4.
Upselaspis caparti Jones, 1955: 284; 1956: 197.

Records

			adult ♂	sub-adult ♂	ovig. ♀	♀	juv.	total	no. of records	
WCD	33°S 17°E	78 m	1					1	1	(benthic)
SAM	23°S 14°E	1 m	4	5	6	3	14	32	3	(planktonic)
FISH	20°S 12°E	95–0 m			1			1	1	(planktonic)

Previous records

Near Walvis Bay (22°S 14°E), plankton (Fage 1951; Jones 1955); Sierra Leone Estuary, 10–12 m (Jones 1956).

Syntypes

Males, females and juveniles, deposited by Fage (1951) in the Museé d'Histoire Naturelle, Paris. Type locality: surface plankton haul, near Walvis Bay, South West Africa (22°S 14°E).

Description

Ovigerous female, length 3,4 mm, from Sandwich Harbour (23°S 14°E). Integument slightly roughened, white, thin, with minute pits. Carapace (Fig. 7A) rounded, lacking carinae; deeper anteriorly than posteriorly, more than one and a half times as long as deep at deepest point. Antennal notch moderate, anterolateral angle rounded with very fine serrations below. Pseudorostral lobes (Fig. 7B) meeting for short distance in front of rounded, eyeless eyelobe.

First pedigerous somite invisible, second half as wide as deep, third to fifth produced laterally to form distinct sideplates. Free pedigerous somites together about two-thirds length of carapace. Abdominal somites cylindrical; abdomen subequal in length to cephalothorax.

Antenna 1 (Fig. 7C) elongate, reaching well beyond pseudorostrum. First and third segments subequal in length, second shorter. Flagellum 2-segmented with two aesthetascs. Accessory flagellum relatively long, 1-segmented.

Basis of maxilliped 3 (Fig. 7D) twice length of remaining segments together, strongly angled; distal prolongation short, not reaching articulation of merus and carpus. Merus much expanded externally, distal tip reaching articulation of carpus and propodus.

Basis of pereiopod 1 (Fig. 7E) one and a half times length of rest of limb, lower border with fine hairs, hooks and plumose setae. Last three segments subequal in length.

Pereiopod 2 (Fig. 7F) elongate, almost as long as pereiopod 1, 6-segmented.

Basis subequal in length to remaining segments together.

Pereiopods 3 (Fig. 7G) to 5 similar, each shorter than preceding limb. Ischium and merus short, subequal in length. Dactyl very small on pereiopod 3, apparently absent from pereiopod 5.

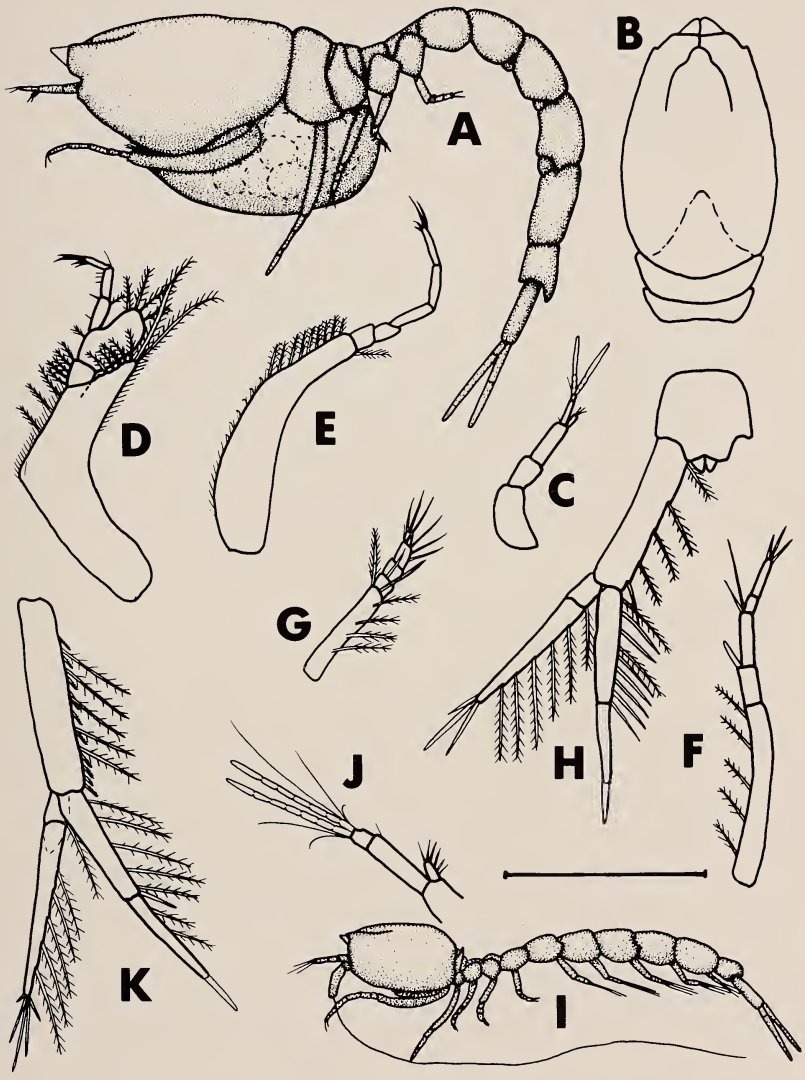

Fig. 7. *Upselaspis caparti*

Ovigerous female. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod. Adult male. I. Lateral view. J. Detail of distal tip of antenna 1. K. Uropod.

Scale line = 2 mm for I; 1 mm for A–B; 0,5 mm for C–H, K; 0,25 mm for J.

Telsonic somite (Fig. 7H) produced between uropods for a short distance, very slightly wider than long. Peduncle of uropod more than one and a half times as long as telsonic somite with four plumose setae and one spine on inner edge. Endopod slightly longer than exopod, first segment longer than second with two plumose setae and seven fine spines on inner edge; second unarmed except for one long stout spine terminally. First segment of exopod less than a quarter length of second with one plumose seta distally on inner edge; second with five plumose setae on inner edge and three slender spines terminally.

Adult male, length 3,8 mm, from Sandwich Harbour. As female, except as follows: integument less translucent. Carapace rectangular in lateral outline (Fig. 7I), a little less than twice as long as deep. Antennal notch and antero-lateral angle wanting. Second pedigerous somite not visible in some, usually very narrow, pointed dorsally and forming very small rounded sideplates laterally; covered anteriorly by posterior edge of carapace. Abdominal somites with sideplates defined ventrally. Abdomen slightly longer than in female.

Flagellum of antenna 1 (Fig. 7J) stouter, bearing several fine setae as well as two aesthetascs. Basis of maxilliped 3 not angled, prolongation of basis narrower and more pointed distally, reaching articulation of merus and carpus. Basis of pereiopod 1 very stout proximally, bearing ten teeth distally on lower edge. Peduncle of uropod (Fig 7K) with five plumose and ten serrate setae. Exopod as in female. First segment of endopod with five plumose setae and one spine; second as long as first with two plumose setae on inner edge.

Length

Adult male	3,8–4,1 mm
Ovigerous female	3,1–3,6 mm

Remarks

The specimens correspond in all details with those described by Fage (1951), except that the second pedigerous somite of the male is sometimes visible, and pereiopods 2 to 5 are relatively longer.

Distribution

Apparently endemic to the coast of west and south-west Africa, usually in estuaries at depths between 1 and 12 m, and usually found off the bottom, although a single benthic specimen is known from 78 m. The presence of this species in Sandwich Harbour constitutes the only records for any cumacean in estuarine conditions in South West Africa. Its distribution appears to be patchy but it may occur in quite large numbers in individual hauls.

Cyclaspoides Bonnier, 1896

Generic diagnosis

Carapace laterally compressed, pseudorostral lobes long. First two or three pedigerous somites incorporated in carapace at least dorsally. Second pereiopod

6-segmented. Telsonic somite long, peduncle of uropod short. Endopod of uropod 1- or 2-segmented. Gut coiled.

Type species

Cyclaspoides sarsi Bonnier, 1896

Remarks

Only one species of Cyclaspoides has previously been reported. The new species is clearly a member of the genus, but since the endopod of the uropod is 2-segmented, the generic diagnosis has been expanded accordingly.

Distribution of Cyclaspoides

C. sarsi is known from the Bay of Biscay (Bonnier 1896) in 950 m and off the coast of Ireland in 698 m (Calman 1905). It is also widely distributed in deep waters of the tropical and northern Atlantic down to 4 934 m (Jones pers. comm.). Calman (1904*a*) tentatively assigned to this species a single specimen from the atrial cavity of an ascidian from Malaya. Until further material becomes available the identity of his specimen must remain in doubt. Since *C. pellucidus* is also a deep-water form, it appears that *Cyclaspoides* is essentially a deep-water genus.

Cyclaspoides pellucidus sp. nov.

Figs 8–9

Records

SAM	34°S 17°E	400 m	1 subadult ♂, 2 ovig. ♀♀ (1 record)
SAM	27°S 32°E	820 m	1 young ♀ (1 record)

Holotype

Ovigerous female, in the South African Museum, SAM–A15490, collected by the S.S. *Pieter Faure* in about 1900. Type locality: approximately 400 m, off the Cape Peninsula (34°25′S 17°50′E). *Pieter Faure* station number SAM–A10602 (PF 17440).

Description

Ovigerous female, holotype, length 5,2 mm. Integument thin, brittle, almost transparent, with fine reticulations. Coiled gut faintly visible. Exhalant siphon elongate, a third as long as carapace. Carapace (Fig. 8A) oval, pseudorostral lobes elongate; antennal notch (Fig. 8B) elliptical, anterolateral angle small, acute, serrated below for a short distance. Eyelobe (Fig. 8C) bluntly rounded, eyeless. Middorsal carina very slightly evident.

First three pedigerous somites fused with carapace dorsally, sideplates of third visible laterally. Free region of thorax very short, about a quarter length

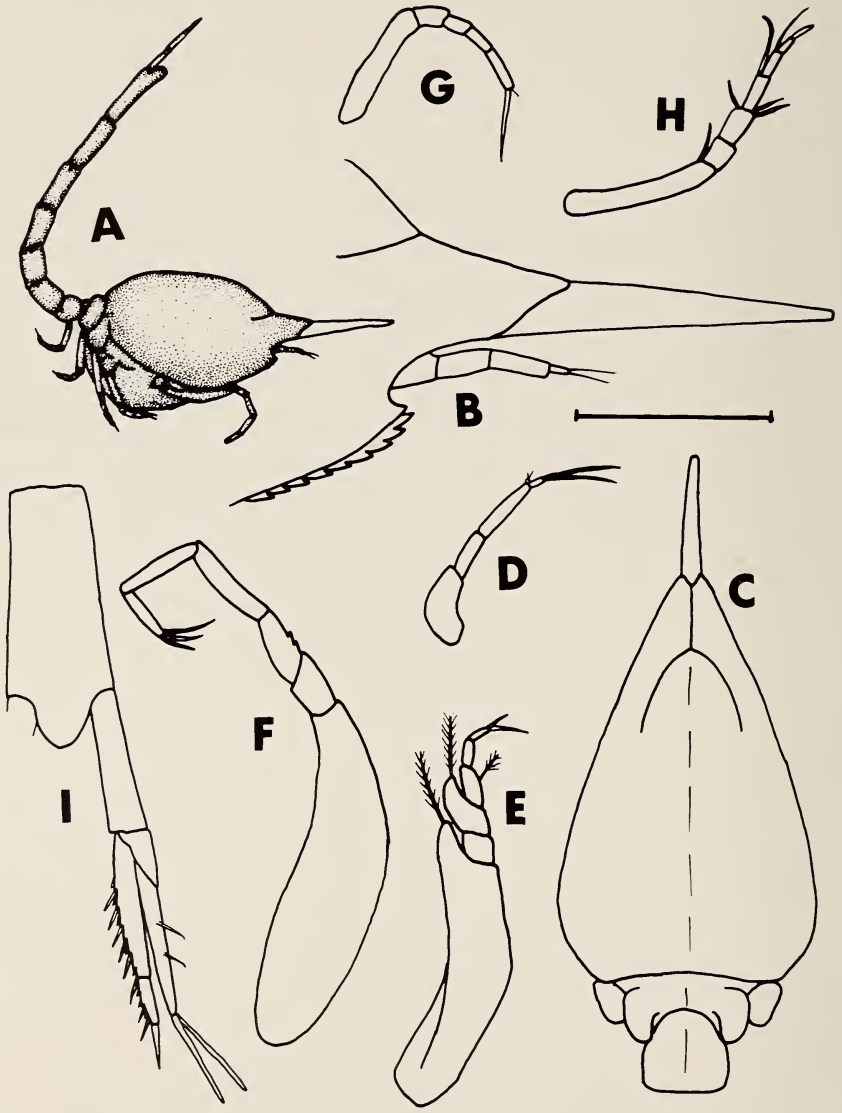

Fig. 8. *Cyclaspoides pellucidus* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Carapace in dorsal view. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2 mm for A; 1 mm for C; 0,5 mm for B, D–I.

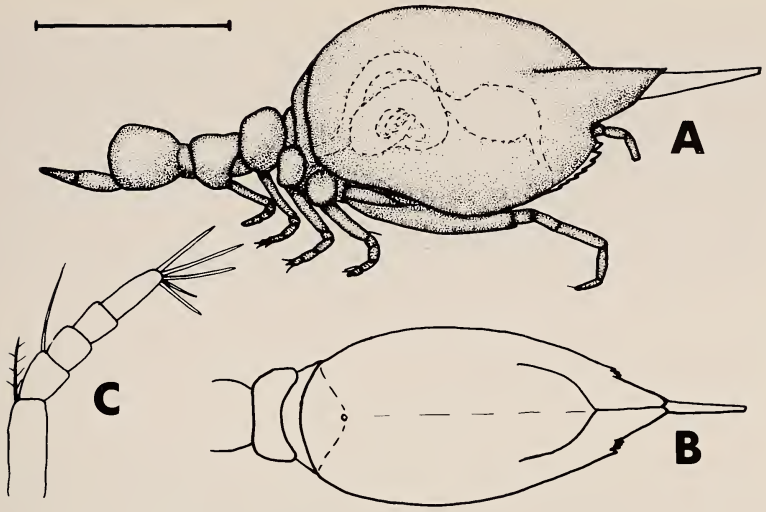

Fig. 9. *Cyclaspoides pellucidus* sp. nov.
Subadult male, paratype. A. Lateral view. B. Dorsal view. C. Pereiopod 2.
Scale line = 1 mm for A–B; 0,5 mm for C.

of carapace. Cephalothorax subequal in length to abdomen. Abdomen slender, cylindrical; first five somites with anterior articulatory peg.

Antenna 1 (Fig. 8D) reaching tip of pseudorostrum, basal segment short, geniculate. Flagellum short, 1-segmented, with two aesthetascs. Accessory flagellum minute, 1-segmented.

Maxilliped 3 (Fig. 8E) stout, short, almost lacking setae. Basis nearly twice length of remaining segments together; distal prolongation short, reaching about half-way along merus. Merus somewhat expanded, almost reaching distal tip of carpus.

Basis of pereiopod 1 (Fig. 8F) stout, longer than remaining segments together. Ischium and merus subequal in length, as are carpus and propodus.

Pereiopod 2 (Fig. 8G) 6-segmented, shorter than pereiopod 3, unarmed except for a single terminal spine. Basis subequal in length to remaining segments together; merus, carpus and propodus subequal in length, slightly shorter than dactyl.

Pereiopods 3 (Fig. 8H) to 5 similar, third longest and fifth shortest, armed with a few spines.

Telsonic somite (Fig. 8I) longer than preceding somite, produced between uropods for about a fifth its length. Peduncle of uropod slightly more than half length of telsonic somite, moderately stout, unarmed. Rami subequal in length. First segment of exopod less than half length of second, unarmed; second armed with two spines on upper edge and two terminally. First segment of endopod three times length of second with six small spines on serrated

inner edge, and a stout one terminally.

Subadult male, paratype, length of cephalothorax 2,7 mm. Last five abdominal somites missing. As female, except as follows: carapace (Fig. 9A) slightly more rectangular, integument thinner, coiled gut clearly visible. Pseudorostral lobes (Fig. 9B) slightly longer. Pedigerous somites 2 and 3 fused with carapace, but suture lines distinct dorsally and laterally.

Distal parts of antenna 1 missing, otherwise as in female. Maxilliped 3 more setose. Basis of pereiopod 1 straight, slightly broader. Pereiopod 2 (Fig. 9C) stouter, basis shorter, no longer than remaining segments together.

Length

Ovigerous female 5,2 mm.

Remarks

This species clearly belongs to Bonnier's genus, being similar to *C. sarsi* in general appearance, as well as having only two free pedigerous somites and a coiled gut. It differs from *C. sarsi* in a number of respects, however: the second and third pedigerous somites are visible laterally in the female, and dorsally as well as laterally in the male, although in both cases they are firmly fused with the carapace (in *C. sarsi* they are indistinguishable or sometimes separated by a faint suture line). In *C. pellucidus* the endopod of the uropod is 2-segmented and the entire uropod slightly longer than the telsonic somite: in *C. sarsi* the endopod is 1-segmented, and the uropod distinctly shorter than the telsonic somite.

The varying number of segments in the endopod of the uropod is not unusual in genera of this subfamily, but it has necessitated expanding the diagnosis of the genus.

Distribution

Known only from two records, one at a depth of 400 m off the Cape of Good Hope, and one from 820 m in the southern Mozambique Channel.

Mossambicuma gen. nov.

Generic diagnosis

First pedigerous somite not visible. Ischium of maxilliped 3 larger than merus. Basis of pereiopod 1 without distal projection. Second pereiopod 6-segmented. Telsonic somite shorter than fifth abdominal somite and longer than peduncle of uropod. Rami of uropod longer than peduncle, endopod 1-segmented.

Type species

M. elongatum sp. nov. (by monotypy).

Remarks

It is with some hesitation that a new genus is erected for this species. In many ways it resembles some species of *Eocoma*, but the form of the carapace is quite different and the first pereiopod lacks the characteristic distal projection. Thus it seems better to erect a new genus which may later be submerged than to add species to *Eocuma*, which is at present well defined.

Mossambicuma elongatum gen. et sp. nov.

Figs 10–11

Records

CON	23°S 32°E	1–2 m	1 adult ♂, 1 ovig. ♀, 1 young ♀, 2 juvs (2 records)

Holotype

Ovigerous female, in the South African Museum, SAM–A15495, collected by A. C. Connell of the NIWR. Type locality: 1–2 m, near Mongue, Morrumbene estuary, Mozambique (23°40′S 35°22′E). NIWR station number CON 3.

Description

Ovigerous female, holotype, length 2,2 mm. Integument uncalcified, flexible. Carapace (Fig. 10A) with scattered shallow pits, one and a half times as long as deep, slightly narrower dorsally due to a shallow depression running midlaterally along carapace. A second smaller depression runs anteroventrally from posterior middorsal region for a short distance. Antennal notch shallow, anterolateral angle poorly defined, obtuse. Pseudorostral lobes produced beyond rounded, eyeless eyelobe for one-fifth total length of carapace (Fig. 10B).

Second pedigerous somite about half as wide as deep, third to fifth about as deep as abdominal somites. Carapace about one and a half times length of free thoracic somites together, cephalothorax equal in length to first five abdominal somites. Abdominal somites cylindrical, elongate.

Antenna 1 (Fig. 10C) elongate, protruding well beyond tip of pseudorostrum. First two segments subequal in length, together as long as third. Flagellum (Fig 10D) 2-segmented with one aesthetasc; accessory flagellum very small, 1-segmented.

Maxilliped 3 (Fig. 10E) short and stout, basis broad and flattened; distal prolongation narrow, reaching beyond articulation of merus and carpus. Ischium as long as next three segments together. Merus wide, distal prolongation reaching articulation of carpus and propodus.

Basis of pereiopod 1 (Fig. 10F) short, half length of remaining segments together, not produced distally. Propodus long, almost equal in length to merus and carpus together.

Pereiopod 2 (Fig. 10G) 6-segmented, basis shorter than rest of limb. Dactyl twice length of propodus.

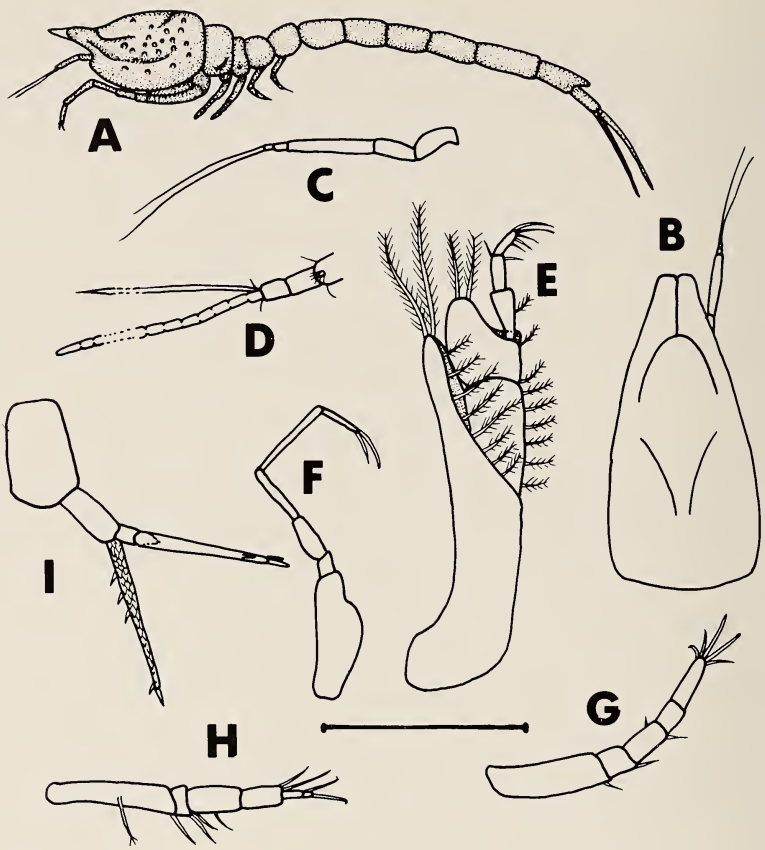

Fig. 10. *Mossambicuma elongatum* gen. et sp. nov.
Ovigerous female, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Detail of distal tip of antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.
Scale line = 1 mm for A; 0,5 mm for B–C, F, I; 0,25 mm for D–E, G–H.

Pereiopods 3 (Fig. 10H) to 5 similar, pereiopod 3 longest and 5 shortest. Merus and carpus stout, merus slightly the longer.

Telsonic somite (Fig. 10I) one and a half times as long as wide, slightly shorter than fifth abdominal somite, little produced between uropods. Peduncle of uropod less than two-thirds length of telsonic somite, less than half length of subequal rami, unarmed. First segment of exopod about a quarter as long as second; second armed with a single small spine dorsally near the tip, and two stouter ones terminally. Endopod 1-segmented, surface covered with small scales, with four very small spines on inner edge and a slightly longer one terminally.

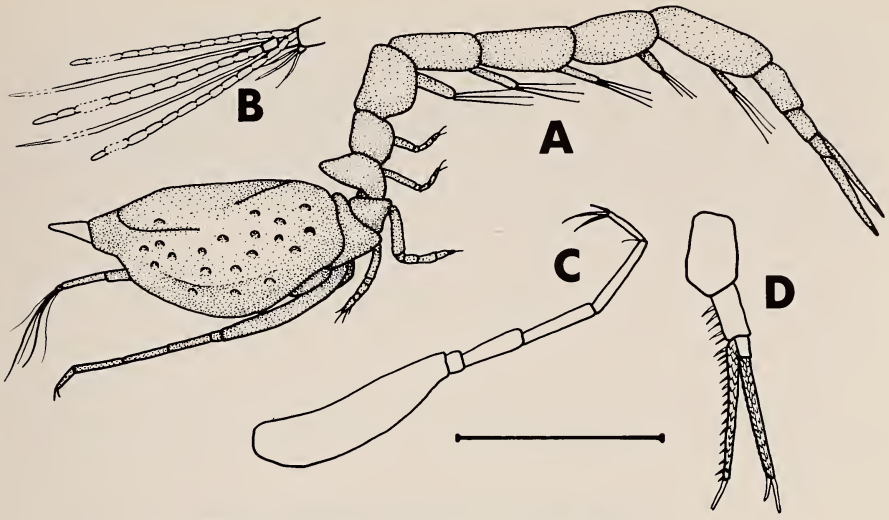

Fig. 11. *Mossambicuma elongatum* gen. et sp. nov.
Adult male, paratype. A. Lateral view. B. Detail of distal tip of antenna 1. C. Pereiopod 1. D. Telsonic somite and uropod.
Scale line = 0,5 mm for A; 0,25 mm for C–D; 0,1 mm for B.

Adult male, paratype, length 2,1 mm. As female, except as follows: carapace (Fig. 11A) slightly longer, pseudorostral lobes shorter. Fourth pedigerous somite produced dorsally to form a blunt point. Sideplates poorly defined ventrally.

Antenna 1 (Fig. 11B) with two aesthetascs arising at base of flagellum and one distally. Basis of maxilliped 3 narrower proximally, ischium slightly shorter. Basis of pereiopod 1 (Fig. 11C) longer, merus narrower and propodus not as greatly elongated. Telsonic somite (Fig. 11D) not at all produced. Peduncle of uropod with five spines on inner edge, endopod with sixteen. Endopod and second segment of exopod scaly.

Length

Adult male	2,1 mm
Ovigerous female	2,2 mm

Remarks

See remarks for genus *Mossambicuma*.

Distribution

So far only five specimens known, all from Morrumbene estuary, Mozambique, at depths from 1 to 2 m.

Austrocuma gen. nov.

Generic diagnosis

Dorsoventrally flattened Bodotriinae with four pedigerous somites visible in the male and five in the female. Eye present. Basis of maxilliped 3 slightly expanded distally. Second to fifth pereiopods 6-segmented. Male with three pairs of pleopods, each with an outer process to the inner ramus. Endopod of uropod 1-segmented.

Type species

Austrocuma platyceps sp. nov. (by monotypy)

Remarks

This genus is the only one in the subfamily in which the male has three pairs of pleopods. The flattened structure of the carapace and the nature of the third maxilliped and first pereiopod are also unusual in the Bodotriinae.

Austrocuma platyceps gen. et sp. nov.

Fig. 12

Records

CP	34°S 18°E	intertidal-2 m	3 adult ♂♂, 1 subadult ♂, 10 ovig. ♀♀, 2 mancas (5 records)
CPR	33°S 18°E	intertidal	3 ovig. ♀♀ (2 records)

Holotype

Ovigerous female, in the South African Museum, SAM–A15480, collected by UCT, 25 April 1956. Type locality: 1 m, Muizenberg Beach, Cape Peninsula (34°06′S 18°29′E). UCT station number CP 463B.

Description

Ovigerous female, *holotype*, length 1,8 mm. Whole animal dorsoventrally flattened (Fig. 12A). Integument smooth, carapace and thorax somewhat calcified, abdomen translucent. Carapace nearly twice as wide as deep with a single pair of lateral carinae, well-defined in the midregion, becoming rounded anteriorly and posteriorly. Anterolateral angle rounded, antennal notch small, triangular. Pseudorostral lobes rounded in lateral view, scalloped in dorsal view (Fig. 12B). Eyelobe wide, slightly pointed anteriorly, bearing reddish pigmented area with two pairs of large lenses on either side and one pair medially. Cephalothorax elliptical in dorsal view. Carapace subequal in length to free thoracic somites, of which first is narrow and second very wide. Cephalothorax nearly one and a half times length of narrow subcylindrical abdomen. Telsonic somite short, very slightly produced between uropods.

Antenna 1 (Fig. 12C) stout, elongate. Basal segment subequal in length to next two segments together. Flagellum 2-segmented with one very short aesthetasc. Accessory flagellum minute, 1-segmented.

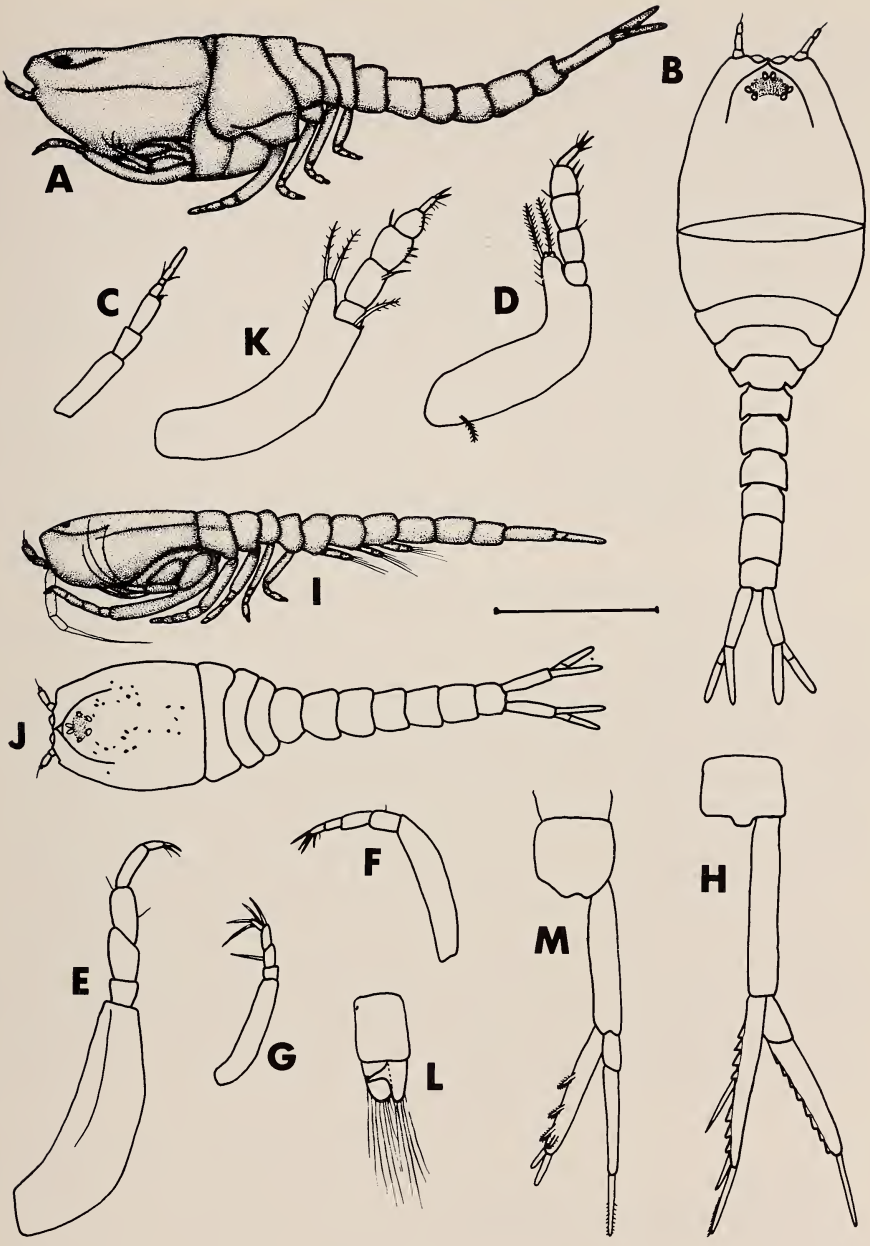

Fig. 12 *Austrocuma platyceps* gen. et sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Dorsal view. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod. Adult male. I. Lateral view. J. Dorsal view. K. Maxilliped 3. L. Pleopod 2. M. Telsonic somite and uropod.

Scale line = 0,5 mm for A, I–J; 0,25 mm for B, D–G, K; 0,15 mm for C, H, L–M.

Maxilliped 3 (Fig. 12D) stout, basis curved through nearly 90°, produced distally beyond tip of ischium. Ischium, merus, carpus and propodus all flattened but not produced distally. Dactyl slender.

Pereiopod 1 (Fig. 12E) very stout, meeting with its partner to form strong protection for the underlying mouthparts. Merus, carpus and propodus subequal in length, merus and carpus stout.

Pereiopod 2 (Fig. 12F) 6-segmented, basis one and a half times length of rest of limb. Merus and carpus subequal in length, as are propodus and dactyl. Dactyl small, armed with a few small spines.

Pereiopods 3 (Fig. 12G) to 5 similar, 6-segmented, shorter than pereiopod 2 and each shorter than preceding one. Ischium and merus subequal in length, as are carpus and propodus. Dactyl apparently wanting.

Telsonic somite (Fig. 12H) short, wider than long; entire somite less than half length of peduncle of uropod. Peduncle unarmed, subequal in length to rami. First segment of exopod less than half length of second, unarmed; second serrated on inner edge with one long terminal spine. Endopod 1-segmented, serrated on inner edge, with one long fine spine and two shorter stouter spines terminally.

Colour in life speckled above due to many dark brown and fewer greenish-white chromatophores; mainly greenish-white below, fading immediately on immersion in alcohol.

Adult male, length 1,4 mm, from Kommetjie, Cape Peninsula. As female, except as follows: cephalothorax narrower, carapace longer than wide (Fig. 12J), nearly twice as long as deep (Fig. 12I). Lateral carina confined to posterior half of carapace, which is excavated ventrally to accommodate the large exopods of maxilliped 3 and pereiopod 1. Second pedigerous somite much narrower. Carapace longer than free thoracic somites, cephalothorax longer than abdomen.

Antenna 1 relatively stouter and slightly shorter. Basis of maxilliped 3 (Fig. 12K) less curved, distal segments stouter. Basis of pereiopod 1 straight, propodus and dactyl stouter, limb relatively longer, slightly more slender. Bases of pereiopods 2 to 5 shorter relative to rest of limb. Three pairs of pleopods present (Fig. 12L), rami bearing long plumose setae. Telsonic somite (Fig. 12M) as long as wide, rounded posteriorly. Peduncle slightly longer than rami. Endopod slightly shorter than exopod with four serrate spines on inner edge. Second segment of exopod not serrate.

Length

Adult male	1,4–1,5 mm
Ovigerous female	1,6–1,8 mm

Remarks

This species is quite distinct from all other members of the subfamily, partly because of its very flattened appearance in both sexes, and more particularly because of the presence of only three pairs of pleopods in the male. The

reduction in number of pleopods is perhaps less strange than may appear at first sight, since this tendency is found in some of the Vaunthompsoniinae as well as routinely in some of the other families. In these forms the thoracic exopods are usually highly developed, as is the case in the males of *Austrocuma platyceps*.

Distribution

At present only a few specimens are known from the shores of the Cape Peninsula, from Muizenberg to Hout Bay, at depths from 0 to 1 m.

Note: Just prior to going to press several more specimens of this species were found intertidally between Ysterfontein and Melkbosch on the south-western Cape coast.

Alticuma gen. nov.

Generic diagnosis

First pedigerous somite visible in both sexes. Second pereiopod 7-segmented. Endopod of uropod 2-segmented.

Type species

Alticuma carinata (Zimmer, 1921) (as *Cyclaspis carinata*).

Remarks

The above combination of characters exhibited by the two species in the collection excludes them from *Iphinoe* and *Cyclaspis*, the genera closest to them, since placing them in either would necessitate the expansion of an existing definition. The limits of the genera of the Bodotriinae are discussed on page 163.

The differences between the two species included in the genus are mainly in the superficial appearance of the carapace, the body and appendages being rather similar in structure. Thus the genus may in fact prove to be a realistic assemblage of species rather than a merely convenient grouping.

Distribution of Alticuma

Thus far limited to waters deeper than 183 m off the coast of southern and eastern Africa.

Alticuma carinatum (Zimmer, 1921) n. comb.

Figs 13–14

Cyclaspis carinata Zimmer, 1921: 126–127, figs 19–21.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
LBT	32°S 17°E	208–500 m				5	1	2	8	5
WCD	34°S 17°E	320 m						1	1	1
SCD	34°S 20°E–34°S 23°E	183–200 m		2		3	1		6	3
SST	35°S 22°E	200 m	2	8	6	5	9	4	34	4
SAM	27°S 32°E–30°S 30°E	550–850 m	1			2	4	9	15	5

Previous records

Type locality, holotype specimen only.

Holotype

Female, deposited by Zimmer (1921) in the Berlin Zoologisches Museum. Type locality: 693 m, off the east African coast (1°S 41°E).

Description

Ovigerous female, length 6,7 mm, from 200 m on the Still Bay transect. Integument translucent with fine reticulations and pits visible at high mag-

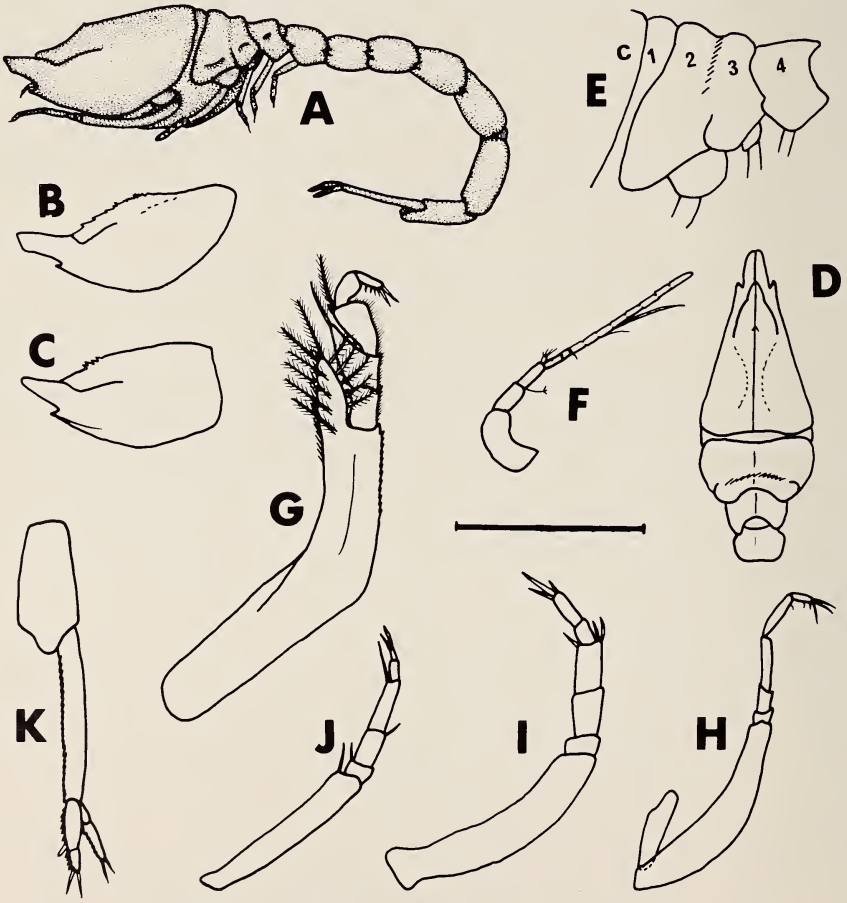

Fig. 13. *Alticuma carinatum*

Ovigerous female (SST). A. Lateral view. D. Dorsal view of carapace. E. Detail of pedigerous somites from the side. F. Antenna 1. G. Maxilliped 3. H. Pereiopod 1. I. Pereiopod 2. J. Pereiopod 3. K. Telsonic somite and uropod.
Females. B. Lateral view of SAM specimen. C. Lateral view of LBT specimen.
Scale line = 2 mm for A–D; 1 mm for E, H, K; 0,5 mm for F–G, I–J.

nifications. Dorsal half of carapace strongly compressed laterally forming a narrow, pointed median carina (Fig. 13A). Pseudorostral lobes elongate, meeting in front of eyelobe for one-sixth total length of carapace. Eyelobe distinct, elliptical, eyeless (Fig. 13D); in lateral view visible above level of pseudorostral lobes and slanting steeply to the elevated posterior region of the carapace. One tooth present midway along middorsal carina. Carapace twice as long as deep. Antennal notch deeply excavate between pseudorostral lobes, anterolateral angle acutely pointed.

(*Note:* the outline of the carapace in lateral view is very variable. The pseudorostral lobes may be as much as a quarter the total length of the carapace (some SAM specimens, Fig. 13B); the eyelobe may not be elevated above the pseudorostral lobes (some LBT and SAM specimens, Figs 13B–C); the anterior part of the middorsal carina may bear 0–2 large teeth (most of the SST specimens, Fig. 13A), or a long row of many minute ones (SAM and some LBT specimens, Fig. 13B), or ones intermediate in size and number (some LBT specimens, Fig. 13C). Only the carapace is variable, the limbs being similar in all specimens. Too few males are available to determine the degree of variability in them, or the likelihood of there being more than one species represented.)

All five pedigerous somites visible laterally, second and third apparently partly fused dorsolaterally (Fig. 13E). Free thoracic somites slightly flanged laterally with a faint middorsal carina. Carapace nearly half as long again as free thoracic somites. Cephalothorax subequal in length to abdomen. Articulatory notches present laterally on all abdominal somites except the last.

Basal segment of antenna 1 (Fig. 13F) geniculate, equal in length to next two subequal segments together. Accessory flagellum short, 1-segmented. Flagellum 1-segmented with one aesthetasc longer than the antenna.

Maxilliped 3 (Fig. 13G) stout, basis angled, distal prolongation reaching articulation between merus and carpus. Ischium longer than wide; merus sharply expanded externally, prolongation reaching distal tip of carpus. Carpus expanded distally, equal in length to subequal propodus and dactyl.

Pereiopod 1 (Fig. 13H) not elongate. Basis equal in length to rest of limb. Carpus and propodus subequal in length, longer than dactyl.

Pereiopod 2 (Fig. 13I) stout, 7-segmented. Basis longer than remaining segments together. Ischium short but distinct.

Pereiopods 3 (Fig. 13J) to 5 similar, less stout than pereiopod 2.

Telsonic somite (Fig. 13K) produced between uropods for nearly a third its length, slightly shorter than peduncle of uropod. Peduncle unarmed but serrate on inner margin, two and a half times length of rami. Exopod slightly longer than endopod, first segment unarmed, half length of second; second only with two terminal spines. First segment of endopod twice length of second with one spine distally on inner edge, second with two terminal spines only. First segment of exopod and both of endopod serrated on inner margin.

Adult male, length 6,7 mm, from 200 m on the Still Bay transect. Differs

from the female as follows: integument less calcified. Carapace less sharply carinate, less sloping behind eyelobe (Fig. 14A). Pseudorostral lobes shorter (Fig. 14B), anterolateral angle obtuse, blunt. First pedigerous somite obscured laterally by anterior projection of second; second narrow, not fused with third. Ventral sideplates well marked on abdomen.

Accessory flagellum of antenna 1 (Fig. 14C) with numerous short aesthetascs. Basis of maxilliped 3 not angled, ischium slightly longer and merus shorter. Basis of pereiopod 1 with eight sharp spines in mid-region.

Peduncle of uropod (Fig. 14D) with six fine spines on inner edge, followed by fourteen serrate setae in pairs, with two spines distally. Second segment of exopod with four plumose setae on inner edge; first of endopod with five fine spines, second with three and a single end-spine.

Length

Adult male	6,7 mm
Ovigerous female	5,8–7,4 mm

Remarks

This species appears to be the same as Zimmer's *Cyclaspis carinata*. However, he describes and figures only the whole animal and the telsonic somite and uropod, and the author has not been able to obtain the type for comparison. Zimmer's figures correspond with the SAM material, except that in the latter the ovigerous female is broader across the posterior part of the carapace, the telsonic somite does not appear to be emarginate posteriorly, and there are no setae on the inner border of the peduncle in the females. The most significant difference is that the inner ramus of the uropod is 2-segmented in all specimens examined, whereas Zimmer's appears to be 1-segmented. How-

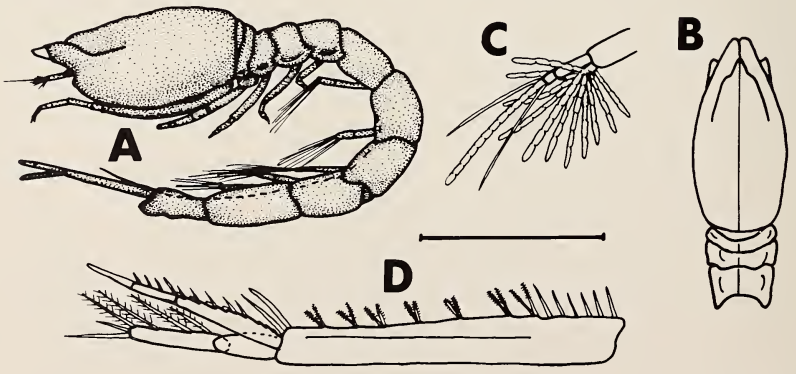

Fig. 14. *Alticuma carinatum*

Adult male. A. Lateral view. B. Dorsal view of carapace. C. Distal tip of antenna 1. D. Uropod.

Scale line = 2 mm for A–B; 0,5 mm for D; 0,25 mm for C.

ever, the diagram is poor, and the author is disinclined to place too much emphasis on this character. It is not possible to state with certainty that all specimens under discussion are conspecific, but from the characteristic general appearance of the animals, it is suggested that they probably are. The variability of the available specimens is confined to characters of the carapace, and so at this stage it is assumed that the various morphological variations are intraspecific, rather than that there are as many as four distinct species, all very closely related, and all represented by very few specimens. The situation may well have to be reviewed when further material is available.

The fusion of the second and third pedigerous somites is extremely unusual in this family, but once again it is a variable character, not present even in all the ovigerous females. Although it may be of considerable functional significance to the living animal, its sporadic occurrence means that it is of no immediate taxonomic value.

Distribution

The most common species in deep waters off South and east Africa, from Lambert's Bay to Kenya, at depths from 183 to 810 m.

Alticuma bellum gen. et sp. nov.

Figs 15–16

Records

SAM	30°S 30°E–26°S 33°E	550–1 300 m	1 adult ♂, 47 subadult ♂♂, 9 ovig. ♀♀, 69 ♂♂ and ♀♀, 13 juvs, 32 mancas (10 records)

Holotype

Ovigerous female, in the South African Museum, SAM–A15479, collected by the South African Museum, 22 May 1976. Type locality: 550 m, southern Mozambique Channel (27°59′S 32°40′E). *Meiring Naude* station number SM 86.

Description

Ovigerous female, holotype, length 10,0 mm. Integument white, slightly crystalline. Carapace (Fig. 15A) divided transversely by strong ridge running across middorsal region almost to ventrolateral edge; smooth posterior to this, lower and with two slight protuberances on either side anterior to it. Pseudorostral lobes short, not meeting in front of eyelobe. Anterolateral angle acute, antennal notch angular (Fig. 15B). Carapace in dorsal view (Fig. 15C) abruptly wider across posterior part due to transverse ridge. Eyelobe eyeless.

Carapace twice as long as deep, one and a half times length of free pedigerous somites together. Cephalothorax equal in length to first five abdominal somites together. Abdominal somites cylindrical.

Antenna 1 (Fig. 15D) small, first segment subequal in length to next two. Flagellum 1-segmented with two aesthetascs; accessory flagellum minute, 1-segmented.

Maxilliped 3 (Fig. 15E) stout, basis strongly angled, about two and a half times length of remaining segments together. Distal prolongation reaching

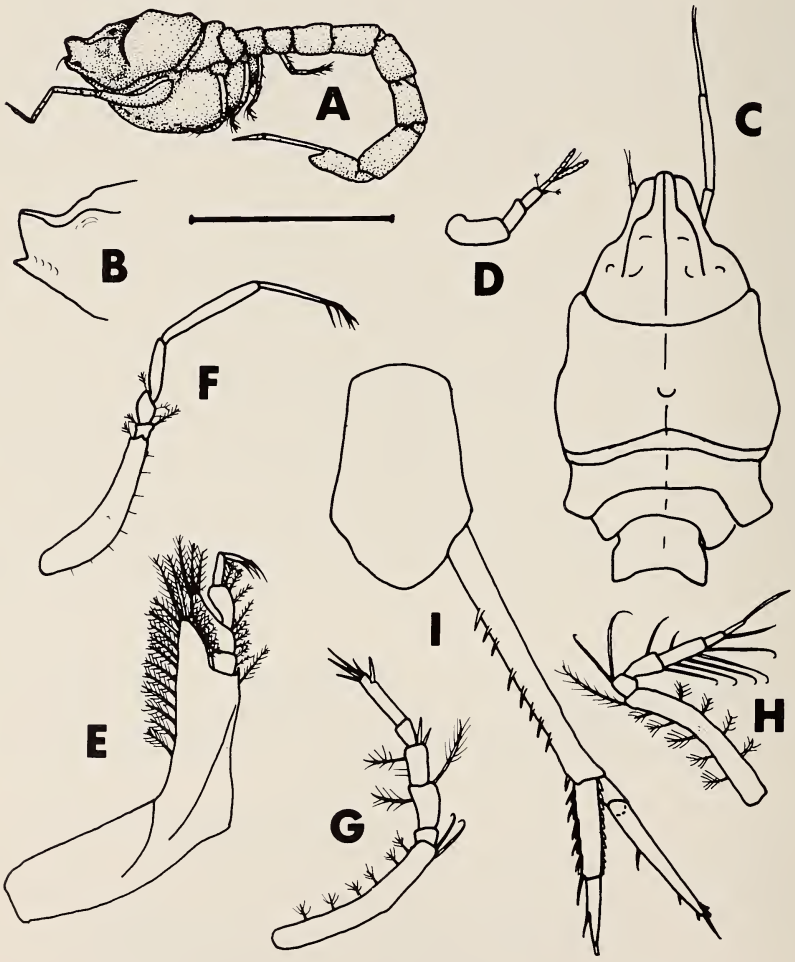

Fig. 15. *Alticuma bellum* gen. et sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 4. I. Telsonic somite and uropod.

Scale line = 4 mm for A; 2 mm for B–C, F; 1 mm for D, E, G–I.

beyond articulation of merus and carpus. Ischium square in outline, merus expanded distally, reaching articulation of carpus and propodus; carpus slightly expanded, propodus and dactyl subequal in length, cylindrical.

Pereiopod 1 (Fig. 15F) elongate, basis less than two-thirds length of rest of limb. Ischium small, half length of merus. Carpus subequal in length to merus and ischium together; propodus and dactyl very long: propodus longer than ischium, merus and carpus together, dactyl slightly shorter.

Pereiopod 2 (Fig. 15G) 7-segmented. Basis subequal in length to rest of limb, ischium small, merus and carpus subequal, merus stouter. Dactyl twice length of propodus.

Pereiopods 3, 4 (Fig. 15H) and 5 similar, basis of 3 longest. Carpus relatively very long with four hooked setae. Propodus and dactyl subequal.

Telsonic somite (Fig. 15I) two-thirds lengths of peduncle of uropod, produced between uropods for about one-third its length. Peduncle of uropod less than twice length of exopod, slender, with eight small spines on inner edge. Exopod slightly longer than endopod, first segment less than one-third length of second, unarmed; second armed with two small spines on inner edge and four terminally. First segment of endopod one and a half times length of second, with six spines on inner edge, interspersed with scale-like serrations; outer edge serrated; second segment with one fine spine on inner edge and a short one terminally (probably broken).

Adult male, length 10,3 mm, from near the type locality. As female, except as follows: carapace (Fig. 16A) less than twice as long as deep, transverse ridge very much fainter, anterolateral angle (Fig. 16B) smaller and less acute; anterior and ventral edges of antennal notch serrated. First pedigerous somite visible dorsally only. Abdominal sideplates distinctly defined ventrally. Anterior end of single specimen damaged. Free pedigerous somites flanged laterally (Fig. 16C).

Basal segment of antenna 1 (Fig. 16D) larger, setose; numerous aesthetascs surrounding flagellum. Basis of maxilliped 3 (Fig. 16E) less angled, merus narrowly expanded. Propodus and dactyl of pereiopod 1 relatively shorter. Merus, carpus and dactyl of pereiopod 2 slightly longer and stouter. Bases of pereiopods 3 and 4 (Fig. 16F) shorter, carpus relatively large.

Both uropods damaged.

Subadult male, *paratype*, length 10,5 mm. Carapace (Fig. 16G) strongly sculptured, transverse ridge very pronounced, posterior and ventral regions with scattered rounded projections. Distinct ridges running posteriorly from antennal notch and posteroventrally from eyelobe suture nearly to ventral edge. Peduncle of Uropod (Fig. 16H) with twelve spines on inner edge. Second segment of exopod serrated distally on inner edge. First segment of endopod serrated on both edges and second on inner edge.

Manca, *paratype*, length 4,6 mm (Fig. 16I). Carapace smoother than in adults, transverse ridge strongly pronounced, edge defined by a row of small rounded tubercles.

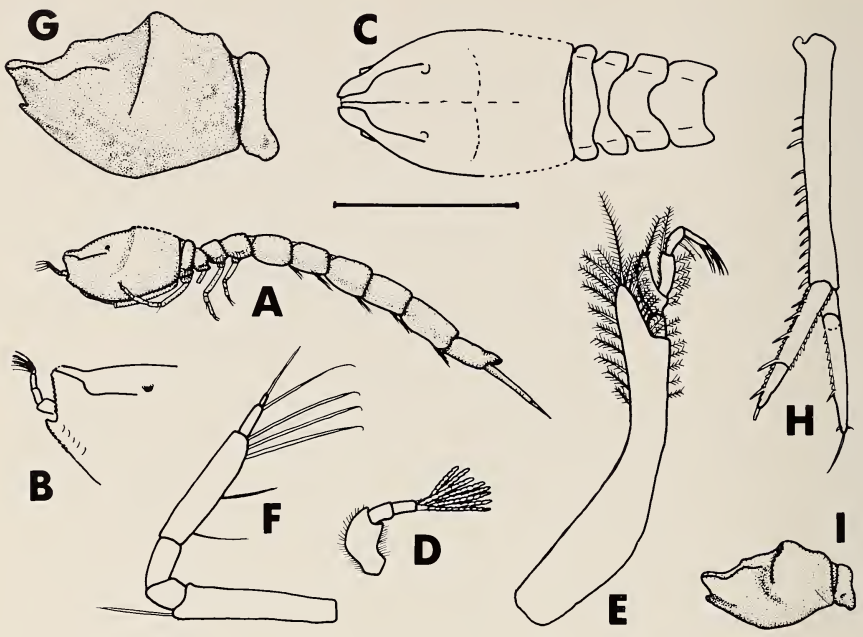

Fig. 16. *Alticuma bellum* gen. et sp. nov.
Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 4.
Subadult male, paratype. G. Lateral view of carapace. H. Uropod.
Manca, paratype. I. Lateral view of carapace.
Scale line = 4 mm for A; 2 mm for B–C, G; 1 mm for D–F, H–I.

Length

Adult male	10,3 mm
Ovigerous female	10,0 mm

Remarks

Although in outward appearance this species is very different from *A. carinatum*, the presence of a free first pedigerous somite, 7-segmented second pereiopod and 2-segmented endopod of the uropod would place them in the same genus. Certainly the appendages are very similar, but the lengths of the pseudorostral lobes are very different and the sculpturing of the carapace is quite dissimilar. The species may easily be distinguished from all other South African members of the subfamily by the transverse ridge on the carapace. It is not very different in external appearance from some of the members of Hale's '*exculpta*' group of *Cyclaspis* (Hale 1944*a*), but is clearly separated from all of them by the nature of pereiopod 2 and the endopod of the uropod.

The uropods of a number of specimens are rather different from those described above. The peduncle is shorter by about a third than the telsonic somite and the rami are subequal in length to the peduncle. The proportions of the rami are the same as those described above. It would appear that all of these specimens are immature, and that this is merely a juvenile variation, as others from the same sample have uropods almost identical with those of adults. The sculpturing of the carapace is also less pronounced in these specimens. Otherwise they seem to be identical to those described above.

Distribution

One of the more common deep-water species from Natal to the southern Mozambique Channel at depths from 550 to 1 300 m.

Iphinoe Bate, 1856

Generic diagnosis

Five pedigerous somites visible, the first short. Second pereiopod 6-segmented. Endopod of uropod 2-segmented, rami no longer than peduncle.

Type species

I. trispinosa Bate, 1856—Europe, to 150 m.

Distribution of Iphinoe

While the greatest depth recorded for *I. producta* is 280 m, for *I. serrata* 1 175 m (Jones, pers. comm.) and for *I. trispinosa* 150 m, the others appear to be confined to depths less than 100 m. Of the 33 species so far described, only 2 are found exclusively north of 40°N, the ranges of 3 extend north of 40°N and south of 40°S and the other 28 are found between these latitudes. Thus *Iphinoe* is essentially a genus of warm, shallow waters.

24 species are found in European and African waters; 3 of these also extend to India, where there are also 2 endemic species; 6 species are found in other regions (Indochina and Australia). Although the known ranges of many species will undoubtedly be increased by further collecting, the rate of endemism appears to be high. 25 species are known only from rather restricted areas, while 3 occur in two or more oceans. 7 of the 9 South African species are endemic, 1 also occurs in west Africa and 1 in both west Africa and India.

Since the South African species of *Iphinoe* appear to be linked only to those from west Africa and India, the following key applies to species occurring in these areas only.

KEY TO THE AFRICAN AND INDIAN SPECIES OF *IPHINOE*

1 Carapace at least two and a quarter times as long as deep 2
– Carapace less than two and a quarter times as long as deep 5
2 Pereiopods 2 and 3 subequal in length ..... *producta* sp. nov.
– Pereiopod 2 about half length of pereiopod 3 3

3 Carapace about two and a quarter times as long as deep; basis of pereiopod 2 longer than rest of limb ..... *africana* Zimmer, 1908—South Africa
– Carapace about three times as long as deep; basis of pereiopod 2 shorter than rest of limb. 4

4 Adults less than 10 mm in length; basis of pereiopod 1 about one and a half times length of rest of limb; basis of pereiopod 2 hardly longer than wide ..... *brevipes* Hansen, 1895—west Africa
– Adults more than 12 mm in length; basis of pereiopod 1 about one and three-quarters length of rest of limb; basis of pereiopod 2 about twice as long as wide ..... *stebbingi* Jones, 1956—South Africa

5 Carapace no more than one and two-thirds times as long as deep, or if nearly twice as long as deep in male then basis of pereiopod 1 no more than three times as long as wide ... 6
– Carapace twice as long as deep; basis of pereiopod 1 about six times as long as wide 10

6 Pseudorostrum upturned, lower edge curled inwards, truncate anteriorly 7
– Pseudorostrum straight, not curled inwards, not obviously truncate 8

7 Antennal notch very deeply excavated, anterolateral angle strongly produced and serrate in both sexes; a pair of dorsal ridges running back from eyelobe almost to posterior edge of carapace ..... *pokoui* LeLoeuff & Intes, 1972—west Africa
– Antennal notch absent in male, moderate in female; anterolateral angle normal, slightly serrate ventrally; faint dorsal ridges on front half of carapace only ..... *crassipes* Hansen, 1895—South African and Indian form

8 Middorsal line of carapace serrate .. *tenella* Sars, 1878—India, west Africa, Mediterranean
– Middorsal line of carapace not serrate 9

9 Prolongation of basis of maxilliped 3 not reaching articulation of merus and carpus; merus not expanded ..... *capensis* (Zimmer, 1921)—South Africa
– Prolongation of basis of maxilliped 3 reaching beyond articulation of merus and carpus; merus very slightly expanded ..... *truncata* Hale, 1953—South Africa (estuarine)
– Prolongation of basis of maxilliped 3 reaching articulation of carpus and propodus; merus strongly expanded ..... *crassipes* Hansen, 1895—west African and Mediterranean form

10 Carapace with a pair of dorsolateral carinae 11
– Carapace lacking dorsolateral carinae 12

11 Carinae confined to dorsal half of carapace ... *plicata* LeLoeuff & Intes, 1972—west Africa
– Carinae running diagonally from anterolateral corner almost to mid-dorsal line ..... *robusta* Hansen, 1895—west Africa

12 0–3 minute serrations middorsally 13
– Numerous serrations on at least half of middorsal carina 14

13 Prolongation of basis of maxilliped 3 comprising one-third its total length; carapace slightly less than twice as long as deep ... *senegalensis* Jones, 1956—South and west Africa
– Prolongation of basis of maxilliped 3 comprising one-quarter its total length; carapace slightly more than twice as long as deep ..... *fagei* Jones, 1955—South Africa

14 Basis of pereiopod 1 subequal in length to rest of limb ... *dayi* Jones, 1960—South Africa
– Basis of pereiopod 1 no longer than next four segments together 15

15 Merus of maxilliped 3 expanded, basis little longer than remaining segments together ..... *sanguinea* Kemp, 1916—India (lentic)
– Merus of maxilliped 3 not expanded, basis one and a half times length of remaining segments together ..... *pigmenta* Kurian, 1961—India (lentic)

Iphinoe stebbingi Jones, 1956

Figs 17–18

Iphinoe brevipes (*non* Hansen, 1895): Stebbing, 1910: 410. Jones, 1955: 288.
Iphinoe stebbingi Jones, 1956: 203–205, figs 10–12; 1960: 175.

Records

			adult ♂	sub-adult ♂	ovig. ♂	ovig. ♀	♀	juv.	total	no. of records
WCD	33–34°S 18°E	65–84 m	2		2	2	6		12	2
FAL & FBY	34°S 18°E	17–90 m	22	143	182	88	413	25	875	79
SST	34°S 22°E	50–80 m	8	8	7	4	16	31	74	8
SCD	34°S 21°E–33°S 27°E	36–100 m	7	18	38	19	80	29	191	21
NIWR	30°S 30°E–29°S 31°E	30–62 m			1		1	2	4	4
SAM	34°S 18°E–34°S 22°E	55–87 m	10		1	12	7		30	8

Previous records

Cape Point to St Francis Bay, 44–62 m (34°S 18°E–33°S 25°E) (Stebbing 1910 (= Jones 1956)); False Bay to Cape Agulhas (34°S 18°E–34°S 19°E), 20–82 m (Jones 1960).

Syntypes

Adults of both sexes deposited by Jones in the British Museum (Natural History): specimens previously identified by Stebbing as *I. brevipes*. Type locality: not specified; material from St Francis Bay (33°S 25°E), off Cape Point Lighthouse (34°S 18°E) and off Sebastian Bluff (34°S 22°E).

Description

Ovigerous female, length 15,9 mm, from False Bay. Slender, elongate. Body cylindrical, carapace slightly compressed laterally. Integument shiny with faint reticulations at high magnifications. Carapace (Fig. 17A) slightly less than three times as long as deep (slightly more in non-ovigerous females), with a faint middorsal carina, especially on posterior half. Antennal notch excavate, anterolateral angle acute, tooth present (Fig. 17B). Pseudorostral lobes meeting for a short distance in front of elongate, eyeless eyelobe (Fig. 17C).

First pedigerous somite visible, about a third as long as second; second longer than third. Thorax slightly longer than carapace, cephalothorax longer by two somites than abdomen.

Antenna 1 (Fig. 17D) of moderate length, first and third segments subequal in length, second slightly shorter. Flagellum 1-segmented with two aesthetascs. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 17E) three times length of remaining segments together; distal prolongation reaching half way along merus (Fig. 17F), merus slightly expanded.

Basis of pereiopod 1 (Fig. 17G) one and three-quarters times length of rest of limb, slender, with several spines on outer distal edge. Ischium and merus subequal in length, as are next three segments.

Pereiopod 2 (Fig. 17H) 6-segmented, short, stout, equal in length to basis of pereiopod 3. Basis twice as long as broad, merus stout.

Pereiopods 3 (Fig. 17I) and 4 stout, 7-segmented.

Pereiopod 5 (Fig. 17J) with ischium, merus and carpus very much enlarged,

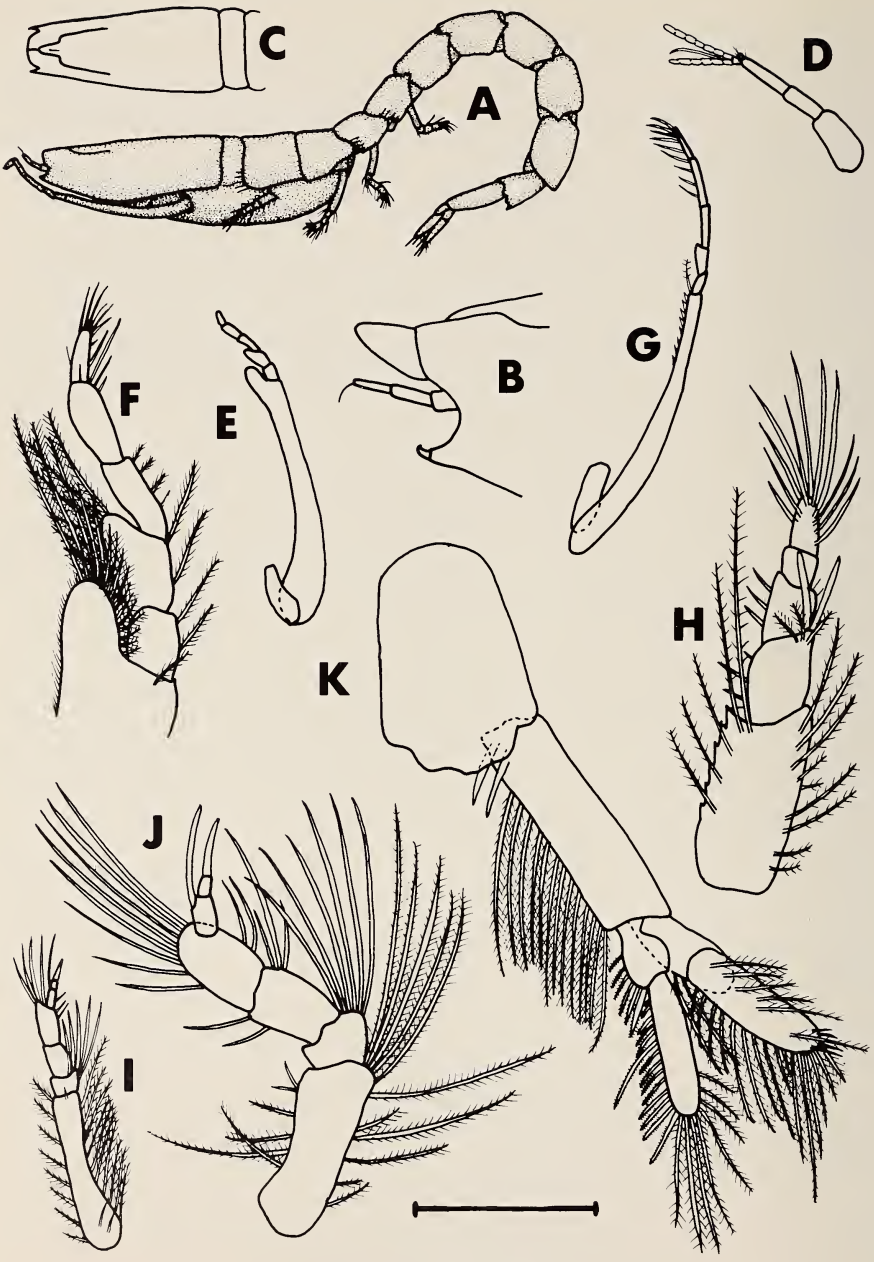

Fig. 17. *Iphinoe stebbingi*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Detail of distal tip of maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Pereiopod 5. K. Telsonic somite and uropod.

Scale line = 4 mm for A, C; 2 mm for E, G; 1 mm for B, D, I, K; 0,5 mm for F, H, J.

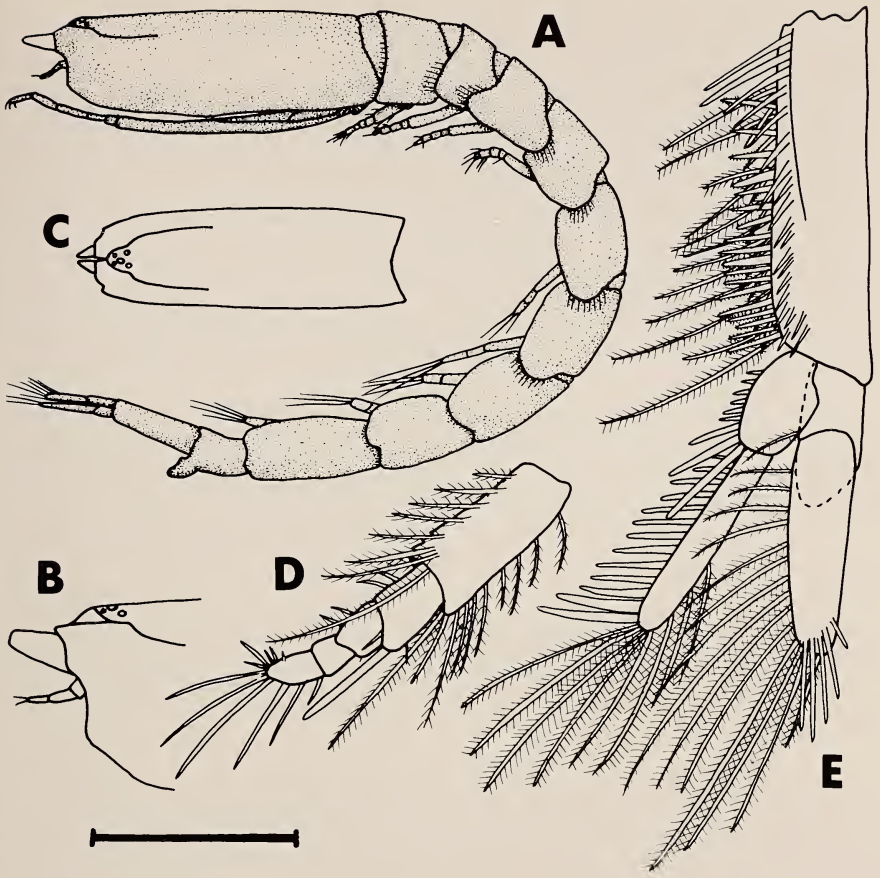

Fig. 18. *Iphinoe stebbingi*
Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Pereiopod 2. E. Uropod.
Scale line = 3 mm for A, C; 1 mm for B; 0,5 mm for D–E.

merus and carpus subequal in length and width to basis, each of the first four segments furnished with fans of stout setae. Propodus and dactyl small, cylindrical.

Telsonic somite (Fig. 17K) one and a half times as long as broad, equal in length to peduncle of uropod. Peduncle with two spines proximally followed by thirteen plumose setae in one row on inner edge. Rami subequal in length. First segment of exopod shorter than second, with two plumose setae on inner edge; second with six plumose setae dorsally and sixteen on inner edge and four short terminal spines. First segment of endopod half length of second with six serrate setae on inner edge, second with fourteen on inner edge and nine plumose

setae on tip and inner edge distally.

Adult male, length 14,9 mm, from False Bay. As female, except as follows: integument thinner and less polished in appearance. Carapace almost exactly three times as long as deep (Fig. 18A). Anterolateral angle wanting, antennal notch only slightly excavated (Fig. 18B). Posteroventral corners of carapace produced backwards to cover part of first pedigerous somite, which is narrowly visible. Eye consisting of five lenses (Fig. 18C), no pigment visible in preserved specimens at least. Sideplates of pereion produced backwards, of fourth also produced forwards to overlap third; abdominal sideplates defined ventrally. Ventral sternites poorly armed, first with two spines produced anteriorly between first pereiopods; second with raised protuberance bearing anteriorly-directed spine; third unarmed; fourth as second; fifth with slight, rounded protuberance.

Carpus of maxilliped 3 slightly less expanded. Pereiopod 2 (Fig. 18D) less stout, relatively longer. Peduncle of uropod (Fig. 18E) stouter, heavily armed with several rows of spines, serrate and plumose setae (about seventy in all). Spines on inner edge of endopod much longer, not serrate.

Length

Adult male	12–18 mm.
Ovigerous female	15–22 mm.

Remarks

The individuals of this species are morphologically uniform, only varying to some extent in size throughout the range, being on the whole a little larger in the south. They compare in all features with Jones's descriptions and figures. For a discussion of the *brevipes–stebbingi–africana* group of species, see p. 213.

Distribution

Endemic to South Africa from the Cape Peninsula to Durban at depths from 17 to 100 m. Absence of records from the west coast almost certainly indicates a real distribution limit at the Cape Peninsula, as *I. stebbingi* has not been found on the west coast despite intensive sampling in the area. The majority of individuals was found between False Bay and Port Elizabeth, only isolated specimens occurring on the Natal coast. There is less evidence that Durban is the northern limit, however, for little material has been collected from shallow waters in northern Natal, and sampling in Mozambique and further north has been scanty or non-existent.

This appears to be the second most abundant species on the southern African coasts (after *I. africana*), constituting more than 26 per cent of the total number of individuals in the collection.

Iphinoe africana Zimmer, 1908

Figs 19–20

Iphinoe africana Zimmer, 1908: 163–164, pl. 2; 1942: 190–191. Fage, 1951: 4–5. Jones, 1955: 288; 1956: 202.
Iphinoe brevipes (*non* Hansen, 1895): Stebbing, 1910: 411; 1913: 45.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
SWD	22°S 14°E	7,5 m	4	7		13		26	50	1
WCD	33°S 17°E–34°S 18°E	62–130 m	2	3		1	2	2	10	3
SB	33°S 17°E	3–29 m	199	221	61	195	206	661	1 543	53

Previous records

'Great Fish Bay' (16°S 11°E) (Zimmer 1908); Walvis Bay (23°S 14°E) (Fage 1951); northern South West Africa to Lüderitz (19°S 12°E–25°S 14°E), plankton (Jones 1955); Kunene River Mouth to Walvis Bay (17°S 11°E–23°S 14°E), 6–100 m (Jones 1956).

Syntypes

Ovigerous females, deposited by Zimmer (1908) in the Berlin Zoologisches Museum. Type locality: no depth given, 'Great Fish Bay', near Kunene River Mouth (16°S 11°E).

Description

Ovigerous female, length 12,3 mm, from Saldanha Bay. Animal elongate, almost cylindrical (Fig. 19A). Integument shiny, slightly translucent, with minute reticulations visible at high magnifications. Carapace about two and one third times as long as deep with distinct middorsal carina bearing eleven teeth (number varies between four and sixteen, usually ten to twelve). Pseudorostral lobes vertically blunted in lateral view (Fig. 19B), short, not much produced anterior to eyelobe. Antennal notch moderately excavate, anterolateral angle acute with several small teeth below along ventral margin. Eyelobe (Fig. 19C) rounded, some reddish pigment visible well below surface, even after long preservation in alcohol; no lenses.

First pedigerous somite visible dorsally and laterally, second almost as wide as deep, third and fourth produced posteriorly. Pedigerous somites together longer than carapace, cephalothorax longer than abdomen by one segment. Abdominal somites cylindrical, fifth longest.

Antenna 1 (Fig. 19D) fairly long, first and third segments subequal in length, second a little shorter. Flagellum 1-segmented with one aesthetasc; accessory flagellum 1-segmented.

Basis of maxilliped 3 (Fig. 19E) more than twice length of remaining segments together; distal prolongation not greatly expanded, reaching junction

of ischium and merus. Merus somewhat expanded externally. Last three segments almost cylindrical, subequal in length.

Pereiopod 1 (Fig. 19F) elongate, basis little longer than rest of limb, serrate on distal third of inner edge.

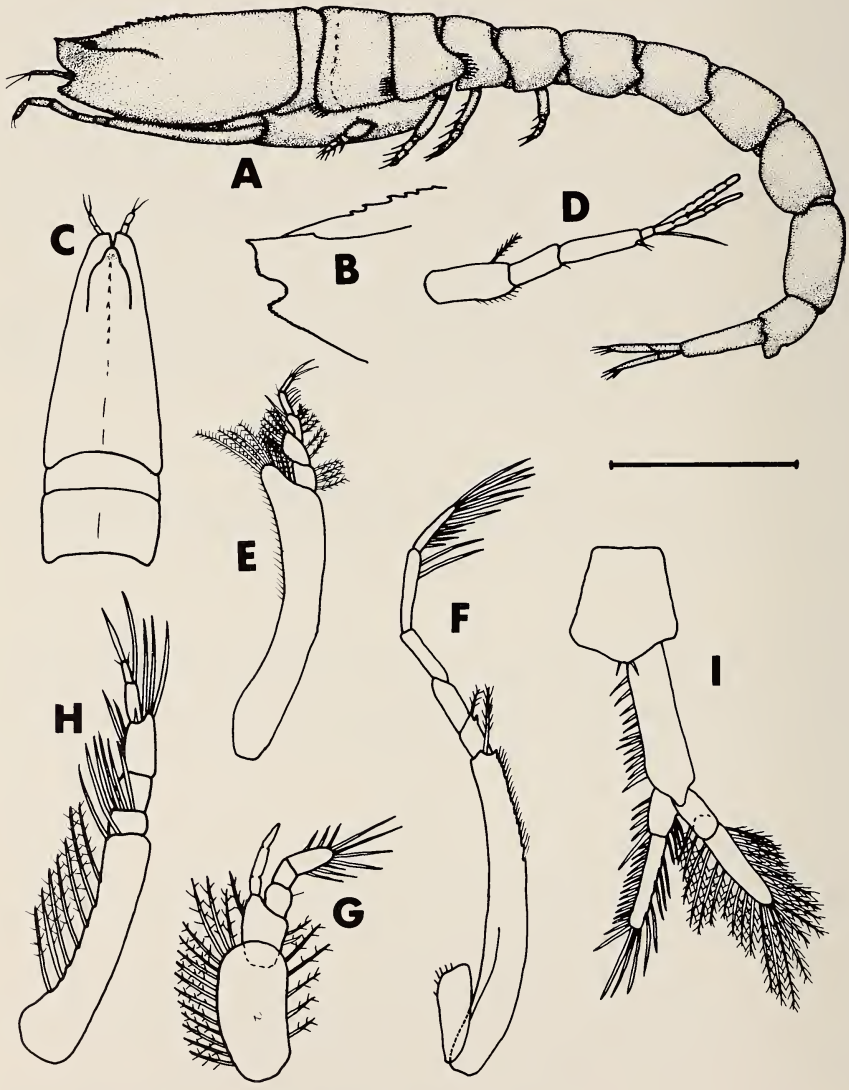

Fig. 19. *Iphinoe africana*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2,5 mm for A, C; 1,5 mm for B, E–F, I; 0,5 mm for D, G–H.

Pereiopod 2 (Fig. 19G) characteristically short and broad, equal in length to basis of pereiopod 3, 6-segmented. Basis twice as long as broad, edged with many plumose setae. Merus broader than long with one very long spine at the expanded distal tip, reaching apex of limb. Carpus and propodus subequal in length, together equal in length to dactyl.

Pereiopods 3 (Fig. 19H) to 5 similar, basis of pereiopod 3 longest. Carpus of pereiopod 5 relatively longer than that of 3 or 4.

Telsonic somite as wide as long at widest point, with two anal setae; in lateral view with small middorsal tooth a third from posterior end, anterior to a slight depression. Peduncle of uropod (Fig. 19I) slightly longer than telsonic somite, subequal in length to rami, with 12 fine sharp spines on inner edge. First segment of exopod two-thirds length of second with two plumose setae on inner border; second segment with twenty-two plumose setae around entire border. First segment of endopod half length of second with five spines on inner and four on outer border; second segment with fourteen sharp spines on inner and five on outer border, plus three terminally.

Adult male, length 9,2 mm, from Saldanha Bay. As female, except as follows: Mid-dorsal carina not serrate (Fig. 20A), antennal notch very shallow, anterolateral angle obsolete, but some serrations present along anteroventral margin for a short distance. Carapace relatively wider anteriorly (Fig. 20B). Second and third pedigerous somites narrower, sideplates of fourth overlapping third and fifth ventrolaterally. Abdominal sideplates defined ventrally. Carapace subequal in length to rest of thorax, cephalothorax and abdomen subequal in length. Armature of thoracic sternites simple: second forming a raised transverse ridge with five spines at equal intervals across the width; third and fourth forming slightly raised projections each with a forward-pointing midventral hook, fifth a low rounded projection.

Aesthetascs of antenna 1 (Fig. 20C) annulated only proximally, accessory flagellum 2-segmented with two short aesthetascs. Pereiopods 2 to 5 less stout and more heavily armed. Pereiopod 2 longer relative to pereiopod 3. Peduncle of uropod with 35 spines of varying length in several rows on inner edge. (Fig. 20D). Second segment of exopod unarmed on outer edge. Armature of endopod much stouter, and including plumose setae.

Length

Adult male	8,0–11,5 mm
Ovigerous female	9,0–15,2 mm

Remarks

Zimmer (1908) described *I. africana* from 'several female individuals'. Apart from slight differences in the degree of expansion of the merus of maxilliped 3 and the carpus of pereiopod 3, the females in the present collection are identical with Zimmer's description and figures. Except for the second pereiopod and uropod figured by Fage (1951), the male has not previously

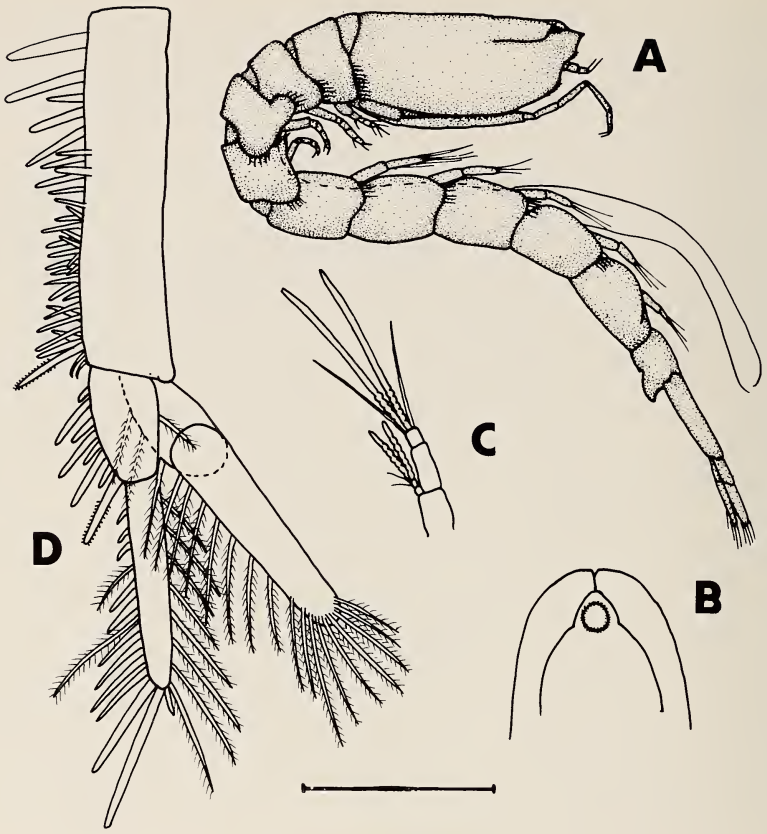

Fig. 20. *Iphinoe africana*
Adult male. A. Lateral view. B. Detail of eyelobe. C. Detail of distal tip of antenna 1. D. Uropod.
Scale line = 2 mm for A; 1 mm for B; 0,5 mm for D; 0,3 mm for C.

been figured or described.

Note: the number of teeth on the middorsal carina is related to age and sex. Juveniles of indeterminate sex have between two and seven teeth, the number increasing in females to between seven and ten in young adults and between ten and sixteen in ovigerous females. In males the reverse is true, two or three teeth occurring in young males with asetous pleopods, while in fully adult males there are no teeth at all.

Distribution

I. africana is endemic to the cold south-western coast of Africa from the Kunene River Mouth to Cape Point. Sufficient collecting has been done on either side of this region to make it probable that the species is indeed confined

to this rather narrow range. It is apparently restricted to areas with a mean annual temperature of less than 20°C. The depth range is 3 to 130 m. It is the most abundant species in these waters, constituting almost 35 per cent of the individuals in the collection.

The *brevipes–africana–stebbingi* group

I. brevipes was described by Hansen in 1895 from the Gulf of Guinea in west Africa and *I. africana* by Zimmer (1908) from the Great Fish Bay in southern Angola. Stebbing (1910, 1913) was of the opinion that they were too similar to warrant the maintenance of two species, and referred all specimens (including some from South Africa) to *I. brevipes*. Zimmer (1916, 1942) maintained not only that these two species were distinct from one another, but that a third species would probably have to be erected for the South African material. This was in fact done by Jones (1956), who gave the name *I. stebbingi* to the new species.

Although distinct from one another, the three species fall into a subgroup within the genus, since they share a number of characters not found in the other members of the genus, in particular the shortness of pereiopod 2 and the elongate, almost cylindrical carapace. Their distinctness from each other is evident ecologically as well as morphologically, since the distribution of the three species is disjunct. They may be distinguished from each other as follows:

I. brevipes	*I. africana*	*I. stebbingi*
pseudorostral lobes pointed anteriorly in lateral view	pseudorostral lobes bluntly truncate anteriorly	pseudorostral lobes somewhat truncate anteriorly
antennal notch small, confined to ventral part of pseudorostrum	antennal notch of moderate size, confined to ventral part of pseudorostrum	antennal notch large, not confined to ventral part of pseudorostrum
anterolateral tooth small and blunt with ventral serrations	anterolateral tooth small, pointed, with serrations above and below	anterolateral tooth long and pointed, reaching beyond anterior tip of pseudorostrum, without serrations
basis of pereiopod 1 one and a half times length of rest of limb	basis of pereiopod 1 equal in length to rest of limb	basis of pereiopod 1 twice length of rest of limb
basis of pereiopod 2 as long as broad	basis of pereiopod 2 twice as long as broad	basis of pereiopod 2 twice as long as broad
telsonic somite rounded posteriorly with two small teeth in midline	telsonic somite bluntly truncate posteriorly with two very small teeth in midline	telsonic somite rounded posteriorly, without teeth
maximal length of adult female 10 mm, of adult male about 8,6 mm	length of adult female 9–15 mm, of adult male 8,0–11,5 mm	minimal length of adult female 15 mm, of adult male 12 mm
serrations on middorsal carina in both sexes	serrations on middorsal carina in juveniles and adult females only	middorsal carina never serrate
southern limit 5°S	northern limit 17°S, eastern limit 18°E	western limit 18°E

Iphinoe producta sp. nov.

Fig. 21

Records

LBT 32°S 17°E 200–280 m 1 subadult ♂, 3 ovig. ♀♀ 1 juv. (3 records)

Holotype

Ovigerous female, in the South African Museum, SAM–A15494, collected during the UCT benthic survey, 24 September 1971. Type locality: 200 m, off Lambert's Bay (32°04′S 17°12′E). UCT station number LBT 67D.

Description

Ovigerous female, holotype, length 9,3 mm. Very slender and elongate. Integument translucent, slightly calcified, very finely reticulate. Anterior three-quarters of middorsal carina of carapace bearing well-developed forward-pointing denticles (Fig. 21A). Pseudorostral lobes (Fig. 21B) about a seventh of total length of carapace. Eyelobe narrow with three very small lenses (Fig. 21C). Anterolateral angle acute, antennal notch distinct but small, confined to ventral half only. Carapace two and a half times as long as deep, slightly longer than free thoracic somites together.

Cephalothorax subequal in length to abdomen. First pedigerous somite visible dorsally and laterally, second slightly wider than third. Abdominal somites cylindrical, lacking defined sideplates ventrally. Middorsal carina present up to and including third pleon somite.

Basal segments of antenna 1 (Fig. 21D) subequal in length. Accessory flagellum short, 2-segmented. Flagellum 2-segmented with one long aesthetasc.

Basis of maxilliped 3 (Fig. 21E) more than two and a half times length of remaining segments together, distal prolongation reaching beyond junction of merus and carpus (Fig. 21F). Merus short and slightly expanded externally.

Pereiopod 1 (Fig. 21G) very slender and elongate, basis slightly shorter than rest of limb with a few stout spines distally along outer edge. Carpus, propodus and dactyl all very slender, more or less subequal in length.

Pereiopod 2 (Fig. 21H) fairly stout, 6-segmented, slightly shorter than posterior pereiopods. Basis equal in length to carpus, propodus and dactyl together. Merus and carpus stout, subequal in length.

Pereiopods 3 (Fig. 21I) to 5 similar, basis of pereiopod 3 longest, merus and carpus of pereiopod 5 longest.

Telsonic somite slightly produced between uropods (Fig. 21J). Peduncle of uropod a little longer than telsonic somite with eleven blunt spines on inner edge. Exopod slightly longer than endopod, first segment unarmed, a third length of second; second with eleven plumose setae on inner edge and six spines terminally, three very long. First segment of endopod less than half length of second, with five spines on inner edge; second with eleven small spines on inner edge and four long ones terminally.

A single damaged *subadult male* was taken at the same station as the holotype female. It appears to be similar in most details, but is not sufficiently whole to allow an adequate description. Its length is approximately 7,5 mm.

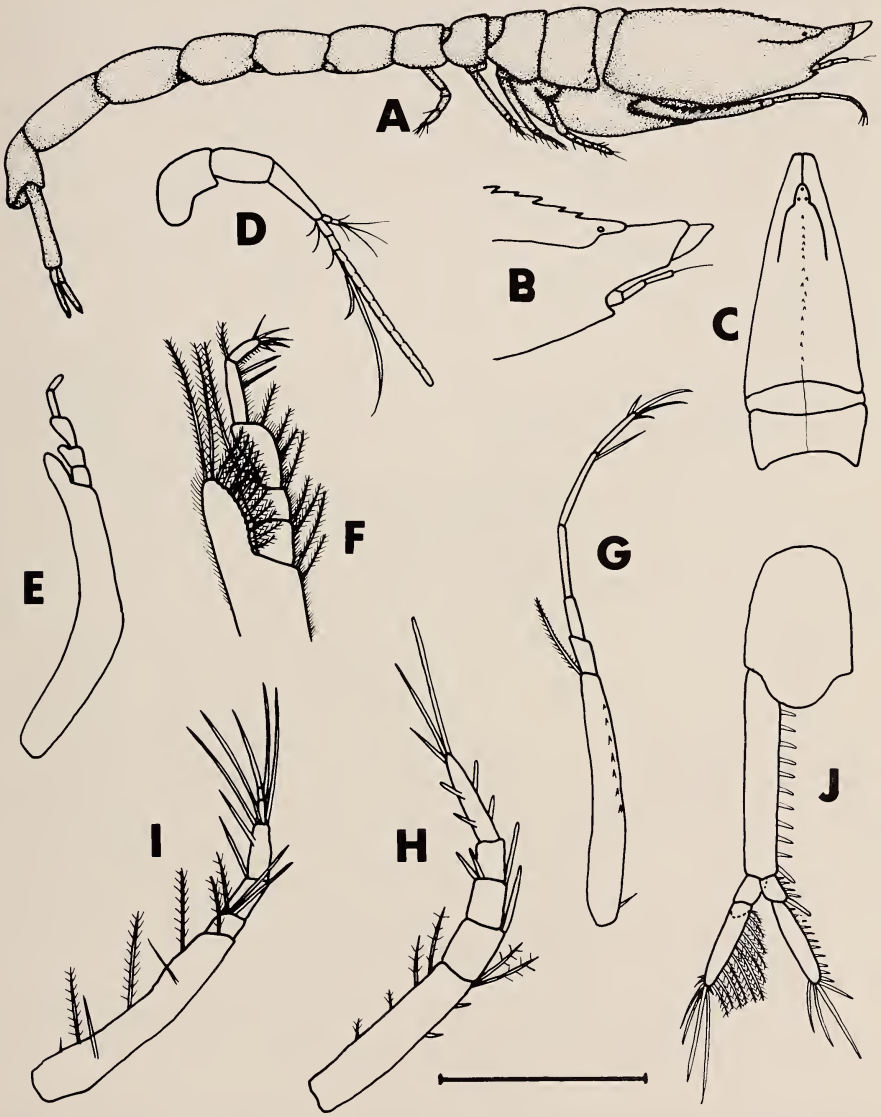

Fig. 21. *Iphinoe producta* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Detail of distal tip of maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, E, G, J; 0,5 mm for D, F, H–I.

Length

Ovigerous female 8,6–9,5 mm.

Remarks

I. producta is undoubtedly a member of the genus *Iphinoe*, most closely resembling *I. ischnura* Zimmer, 1952, from Indo-China. Apart from other minor differences, the two species may be distinguished by the more elongate carapace with more numerous serrations, the longer bases of pereiopods 2 to 5 and the longer first segment of the endopod of the uropod in *I. producta*. *I. ischnura* reaches 4,5 mm in length and *I. producta* 9,6 mm. It may be distinguished from *I. dayi* Jones, 1960, by the more robust form and the presence of two aesthetascs on the flagellum of the first antenna in the latter species, and from *I. tenella* Sars, 1878, *I. elisae* Băcescu, 1950, and *I. serrata* (Norman, 1867) by the shorter carapace in these three species.

Distribution

Five specimens known, all from the south-western coast of South Africa at depths between 200 and 280 m.

Iphinoe dayi Jones, 1960

Figs 22–23

Iphinoe dayi Jones, 1960: 175–177, fig. 2.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
WCD	33°S 18°E	65 m	1						1	1
FAL & FBY	34°S 18°E	23–87 m	28	10	16	22	24	27	127	45
SST	34°S 21°E	80 m	2	1	7	1	2	4	17	4
SCD	34°S 25°E–33°S 27°E	26–84 m					3	3	6	4
SAM	?	?					1		1	1

Previous records

False Bay (34°S 18°E), 20–58 m (Jones 1960).

Holotype

Adult male, designated by Jones (1960), in the British Museum (Natural History). Type locality: 20 m, False Bay (34°S 18°E).

Description

Ovigerous female, length 9,6 mm, from False Bay. Integument finely reticulate, neither shiny nor translucent. Carapace somewhat compressed laterally, middorsal carina bearing eight teeth (varies between eight and ten) on anterior half (Fig. 22A). Carapace twice as long as deep, pseudorostral lobes

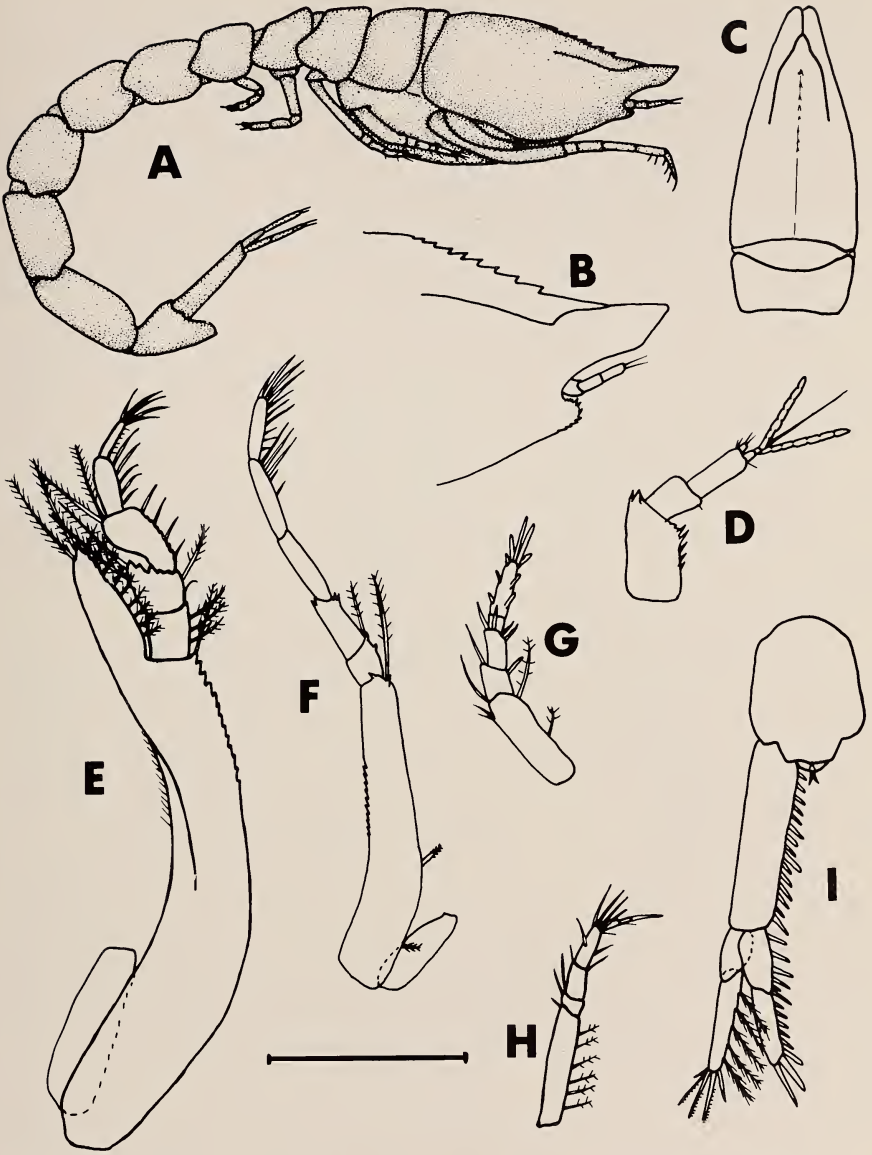

Fig. 22. *Iphinoe dayi*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, F–I; 0,5 mm for D–E.

well developed, produced beyond eyelobe for about one-seventh of total length of carapace. Anterolateral angle (Fig. 22B) rounded, bearing several small teeth. Antennal notch deeply excavate, set back from pseudorostral lobes. Eyelobe somewhat elongate, eyeless (Fig. 22C).

First pedigerous somite visible dorsally and laterally, second and third of equal width, third produced backwards to overlap fourth. Carapace slightly longer than free thoracic somites together. Cephalothorax longer than abdomen by one somite. Abdominal somites cylindrical.

Antenna 1 (Fig. 22D) fairly short, basal segment half as wide as long, edged with denticles. Flagellum short, 2-segmented, with two aesthetascs and one fine seta. Accessory flagellum short, 1-segmented.

Basis of maxilliped 3 (Fig. 22E) curved, two and a half times length of remaining segments together; distal prolongation elongate, almost reaching distal tip of carpus. Merus short, little expanded, wider and denticulate distally. Carpus inserted on inner half of merus only.

Basis of pereiopod 1 (Fig. 22F) equal in length to rest of limb. Ischium half length of merus. Last three segments subequal in length.

Pereiopod 2 (Fig. 22G) 6-segmented, very slightly shorter than pereiopod 3. Basis shorter than rest of limb, dactyl furnished with a number of short blunt spines.

Pereiopods 3 (Fig. 22H) to 5 similar, pereiopod 3 longest.

Telsonic somite somewhat produced between uropods, less than one and a half times as long as wide, about two-thirds length of peduncle of uropod. Peduncle (Fig. 22I) with fifteen short, blunt spines on inner edge. Exopod slightly longer than endopod, two-thirds length of peduncle. First segment a third length of second, unarmed; second with five plumose setae on inner edge and five terminal spines. Segments of endopod subequal in length, each with six spines on inner edge, second also with two spines terminally.

Adult male, length 8,9 mm, from False Bay. As female, except as follows: teeth of middorsal carina smaller and between five and seven in number (Fig. 23A). Anterolateral angle obsolete, antennal notch shallow (Fig. 23B) with a few small serrations below. Eye present (Fig. 23C) in the form of two small lenses and a little pigment (although in some the eye is well developed). Sideplates of fourth pedigerous somite overlapping third anteriorly and fifth posteriorly. Abdominal sideplates defined ventrally. Thoracic sternites simple, that of first pedigerous somite forming a single mid-ventral spine and of third and fifth forming small rounded projections (no armature on second or fourth).

Merus of maxilliped 3 (Fig. 23D) a little more expanded, carpus and propodus narrower. Peduncle of uropod (Fig. 23E) stouter, with about forty short blunt spines and serrate setae in several rows on inner edge. Second segment of exopod with seven plumose setae on inner edge and three long serrate setae terminally. First segment of endopod with twelve spines of various types, unevenly spaced; second with an even row of slender spines on inner edge and two stout serrate setae terminally.

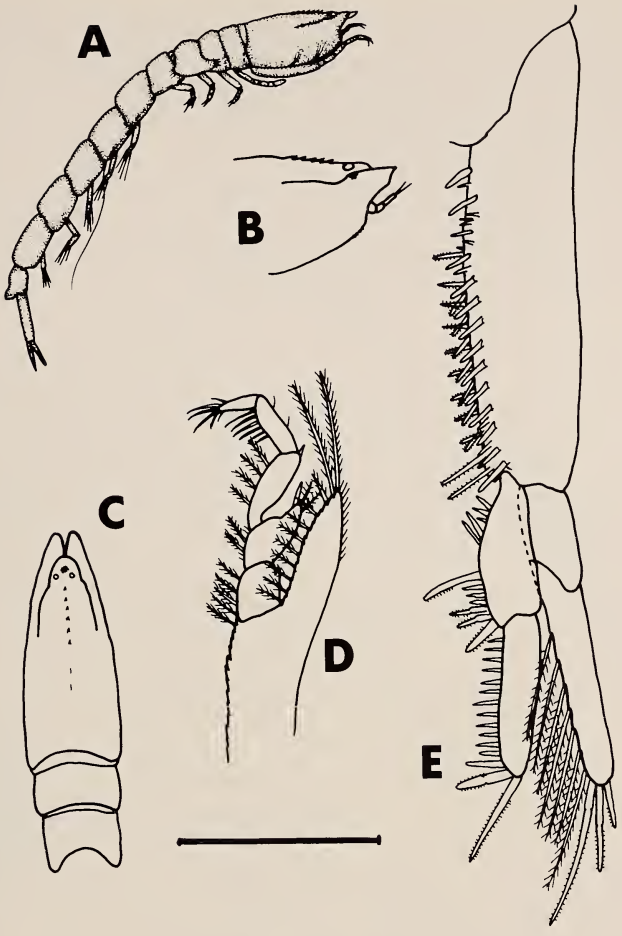

Fig. 23. *Iphinoe dayi*

Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Distal tip of maxilliped 3. E. Uropod.

Scale line = 4 mm for A; 2 mm for B–C; 0,5 mm for D–E.

Length

Adult male	8,6–10,6 mm
Ovigerous female	8,3–11,2 mm

Remarks

Only the male of this species has previously been described (Jones 1960). The present specimens have been compared with paratypes identified by Jones, and there are no differences of any degree, apart from the varying degree of

development of the eye in adult males. A much-mutilated specimen of *I. dayi*, now in the possession of the South African Museum, was tentatively labelled by Stebbing (unpublished) as *I. tenella*, and the two species are not dissimilar. But *I. dayi* may be distinguished from all other species having a serrated mid-dorsal carina in the male as follows: *I. tenella*, *I. ischnura*, *I. elisae* and *I. producta* have only one aesthetasc on the flagellum of the first antenna and *I. serrata* is serrate for the whole length of the mid-dorsal carina. *I. dayi* may further be distinguished from *I. producta*, the only other species from southern Africa in which the male is serrate, by the greater length of the carapace in *I. producta* and the generally far more slender body and limbs.

Distribution

Apparently endemic to South Africa from the Cape Peninsula to East London at depths from 23 to 87 m. The relative rarity of this species means that the limits of its range can be determined with less finality than can those of *I. africana* and *I. stebbingi*. Nevertheless, it is fairly common in those areas where it is known to occur, and accounts for more than 3 per cent of the total number of individuals in the collection.

Iphinoe fagei Jones, 1955

Figs 24–25

Iphinoe fagei Jones, 1955: 285–287, figs 3–4; Jones, 1956: 199.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
SWD	26°S 15°E	26 m						8	8	1
WCD	32°S 17°E–32°S 18°E	11–172 m	15	11	2	15	18	24	85	6

Previous records

South West Africa (south of Walvis Bay) (22°S 14°E–25°S 14°E), plankton (Jones 1955); South West Africa (23°S 14°E), 22–76 m (Jones 1956).

Holotype

Not designated. Type locality: plankton, South of Walvis Bay (22°S 14°E).

Description

Ovigerous female, length 6,9 mm, from St Helena Bay (32°S 18°E). Integument translucent, finely reticulate, appearing slightly crystalline. Carapace oval with two (varying between none and three) small teeth on middorsal carina, little over a third of the distance from anterior tip (Fig. 24A). Middorsal carina present only on anterior two-thirds of carapace. Pseudorostral lobes meeting for a short distance in front of eyelobe (Fig. 24B). Eyelobe (Fig. 24C) rounded

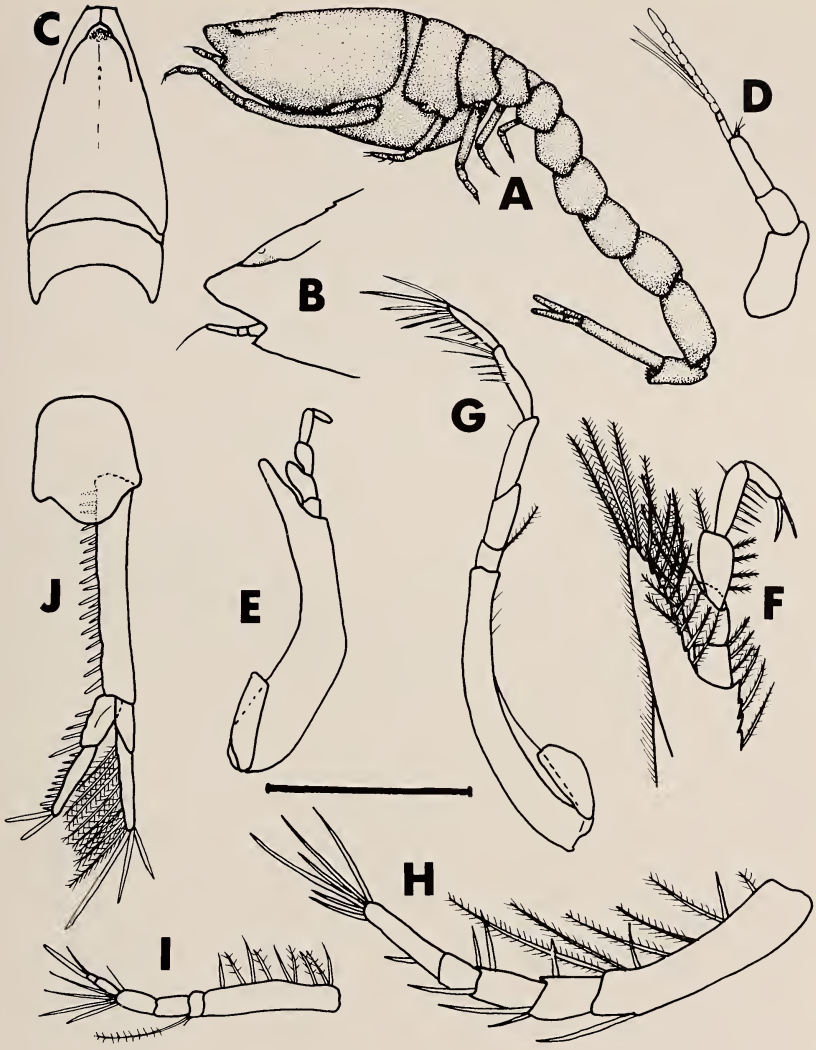

Fig. 24. *Iphinoe fagei*

Ovigerous female. A. Lateral view. B. Anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Detail of distal tip of maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, E; 0,5 mm for D, F–J.

with three (or more) small, indistinct lenses, slightly pigmented. Anterolateral angle acute with small tooth at apex, antennal notch excavate, angular.

Carapace twice as long as deep, longer than free thoracic somites together. First pedigerous somite exposed for a short distance, second broad. Cephalo-

thorax little longer than abdomen; abdominal somites cylindrical.

Antenna 1 (Fig. 24D) of moderate length, first segment longest and second shortest. Flagellum 2-segmented with one aesthetasc; accessory flagellum small, 1-segmented.

Basis of maxilliped 3 (Fig. 24E) more than two and a half times length of remaining segments together; distal prolongation narrow, nearly reaching distal tip of carpus. Ischium (Fig. 24F) slightly longer than wide, merus produced externally, tip reaching half-way along carpus.

Pereiopod 1 (Fig. 24G) elongate, basis curved, subequal in length to rest of limb. Last three segments fairly stout, subequal in length.

Pereiopod 2 (Fig. 24H) stout, 6-segmented. Basis slightly shorter than rest of limb. Dactyl fairly long, strongly armed at tip.

Pereiopods 3 (Fig. 24I) to 5 similar, basis of pereiopod 3 longest.

Telsonic somite slightly produced between uropods (Fig. 24J), more than half as long as penducle. Peduncle nearly twice length of rami with twenty-one fine spines on inner edge. First segment of exopod shorter than second, unarmed; second with eight plumose setae on inner edge and three terminal spines. First segment of endopod shorter than second with four spines on inner edge; second with nine short spines on inner edge and two long ones terminally.

Adult male, length 7,5 mm, from St Helena Bay. As female except as follows: integument thinner, carapace (Fig. 25A) without middorsal carina; antennal notch much shallower (Fig. 25B), anterolateral angle obtuse, poorly defined. Eye present (Fig. 25C), consisting of three to five large lenses (distinct if white pigment present below, otherwise difficult to see). Sideplates present on all abdominal somites, fourth thoracic sideplate overlapping third and fifth. First pedigerous somite visible only dorsally and dorsolaterally. Sternite of first pedigerous somite armed with three plumose setae pointing posteriorly on either side; second with large rounded projection bearing forward-directed tooth; third with slight transverse ridge; fourth unarmed; fifth with small rounded projection.

Flagellum of antenna 1 (Fig. 25D) surrounded by several short aesthetascs. Basis of pereiopod 1 armed with ten spines proximally on lower edge. Prolongation of basis of maxilliped 3 somewhat longer (Fig. 25E). Merus of pereiopod 2 (Fig. 25F) longer. Peduncle of uropod (Fig. 25G) more than one and a half times length of rami, with about forty-two spines on inner edge. Second segment of exopod with about ten plumose setae on inner edge and four spines terminally. First segment of endopod with twelve spines on inner edge, second with thirteen, plus two larger ones subterminally and three plumose setae terminally.

Length

Adult male	6,7–8,3 mm
Ovigerous female	6,7–9,8 mm

Remarks

I. fagei was first described by Jones (1955) from plankton collected by the R.R.S. *William Scoresby* off the coast near Walvis Bay. Further benthic samples were collected by the *Galathea*, also off Walvis Bay, and identified by Jones (1956). The author has examined some ovigerous females from the latter collection and finds that they agree in morphological detail with those of the present collection. However, the *Galathea* specimens are transparent and slightly smaller, whereas those of the author are quite translucent and brittle due to a very much thicker integument. The adult males in the present collection agree with Jones's description and figures.

Most females may be distinguished from other females in the genus by the presence of one to three small teeth behind the eyelobe, but the teeth are absent

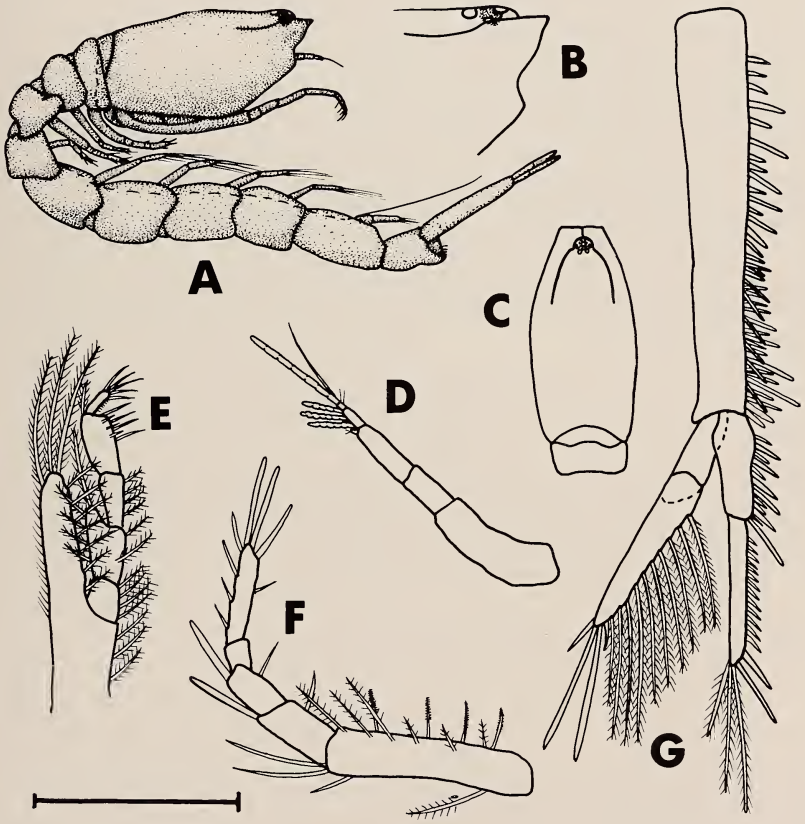

Fig. 25. *Iphinoe fagei*

Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Distal tip of maxilliped 3. F. Pereiopod 2. G. Uropod.

Scale line = 2 mm for A, C; 1 mm for B; 0,5 mm for D–G.

in some specimens. The latter may be distinguished by the smooth carapace which is almost exactly twice as long as deep, and the similar lengths of pereiopods 2 and 3. The species most closely resembling *I. fagei* is *I. senegalensis* Jones, 1956, from the shore in west Africa. The two may be distinguished primarily by the longer basis of maxilliped 3 and the greater body size of *I. fagei*.

Distribution

Apparently endemic to the south-western coast of southern Africa from Walvis Bay to St Helena Bay, at depths from 11 to 172 m, and constituting a little over 2 per cent of the individuals in the collection. Its distribution appears to be patchy, a few hauls yielding large numbers of individuals.

Iphinoe senegalensis Jones, 1956

I. senegalensis Jones, 1956: 200–201, figs 7–8; Jones 1960: 175.

A single adult male from an earlier UCT collection (not in the author's possession) was identified by Jones (1960) as *I. senegalensis*. The position (32°S 18°E) at a depth of 1 m suggests that the specimen came from Langebaan Lagoon. As Jones pointed out, it is not easy to identify with confidence a single adult male of this genus, and confirmation of the occurrence of *I. senegalensis* in South Africa will have to await the collection of more material. The species, which previously has been found only on the beach at Goreé in Senegal, is very similar to *I. fagei*. Differences between the two are mentioned in the discussion of *I. fagei* above.

Iphinoe crassipes Hansen, 1895

Figs 26–27

Iphinoe crassipes Hansen, 1895: 53–54, pl. 4 (figs 4–4f). Stebbing, 1910: 412–413, pl. 45; 1913: 43–44, figs 21–22. Fage 1928: 331. Zimmer, 1942: 191–192. Kurian, 1951: 84–86; 1954: 276. Jones, 1956: 202, fig. 9. Băcescu, 1961: 501, fig. 4. LeLoeuff & Intes, 1972: 43.

Iphinoe macrobrachium Calman 1904*a*: 173, pl. 4 (figs 72–75).

Records

			adult ♂	sub-adult ♂	ovig. ♂	ovig. ♀	♀	juv.	total	no. of records
SB	33°S 18°E	13–29 m			1	4	2	6	13	4
FAL & FBY	34°S 18°E	16–39 m		4	1	12	3	15	35	7
SCD	34°S 21°E–33°S 25°E	44–79 m	8	3	1	3	1	8	24	7
SAM A 688	33°S 26°E	92 m	1						1	1
NIWR	30°S 30°E–28°S 32°E	23–103 m	12	7	5	19	14	13	70	20

Previous records

Gulf of Guinea, plankton (Hansen 1895); Ceylon, 8–14 m (Calman 1904*a*); South Africa (East London) (32°S 28°E), 75 m (Stebbing 1910); tropical west

Africa (Fage 1928; Jones 1956; LeLoeuff & Intes 1972); India, 6–32 m (Kurian 1951, 1954); Red Sea (Băcescu 1961).

Holotype

Immature male, length 3,2 mm, unique. Type locality: Gulf of Guinea.

Description

Ovigerous female, length 7,2 mm, from the south coast near Knysna. Integument rather thin and delicate, little calcified, somewhat transparent. Reticulations and pits visible at high magnifications producing a finely crystalline appearance. Carapace little more than one and a half times as long as deep with several shallow longitudinal furrows (Fig. 26A). Middorsal carina forming double row of very small serrations on middle part of carapace only. Eyeless eyelobe elevated above pseudorostral lobes in lateral view (Fig. 26B). Pseudorostral lobes short, rounded, slightly upturned and truncate anteriorly, curled inwards in dorsal view (Fig. 26C). Anterolateral angle acute with several small serrations below. Antennal notch rounded, of moderate size. Five free pedigerous somites, together as long as carapace; first narrow, second wider ventrally.

Cephalothorax equal in length to first five abdominal somites. Abdominal somites almost cylindrical with sideplates poorly defined posteroventrally on each somite.

Antenna 1 of moderate length (Fig. 26D), second segment about half length of first or third. Flagellum 2-segmented with two slender spines. Accessory flagellum 1-segmented, without setae.

Basis of maxilliped 3 (Fig. 26E) very wide and short, about one and a half times length of remaining segments together, serrate on inner edge. Distal prolongation particularly long, narrowed distally, reaching half-way along propodus. Merus also much expanded, distal edges parallel for some distance, reaching more than half-way along propodus.

Basis of pereiopod 1 (Fig. 26F) particularly short, equal in length to next three segments together, slightly curved. Carpus wide, slightly longer than subequal propodus and dactyl.

Pereiopod 2 (Fig. 26G) relatively short and stout, basis very short, subequal in length to merus, carpus and propodus together. Dactyl stout, strongly armed, subequal in length to basis.

Pereiopods 3 (Fig. 26H) to 5 similar, merus and carpus stout, carpus strongly armed distally.

Telsonic somite (Fig. 26I) well produced between uropods, with two fine anal setae. Peduncle of uropod little longer than telsonic somite, armed with seven evenly-spaced stout spines on inner edge. Exopod of uropod two-thirds length of endopod, only slightly longer than first segment of endopod. First segment of exopod half length of second, unarmed; second segment armed with two very small spines on inner edge and six long stout ones terminally. First

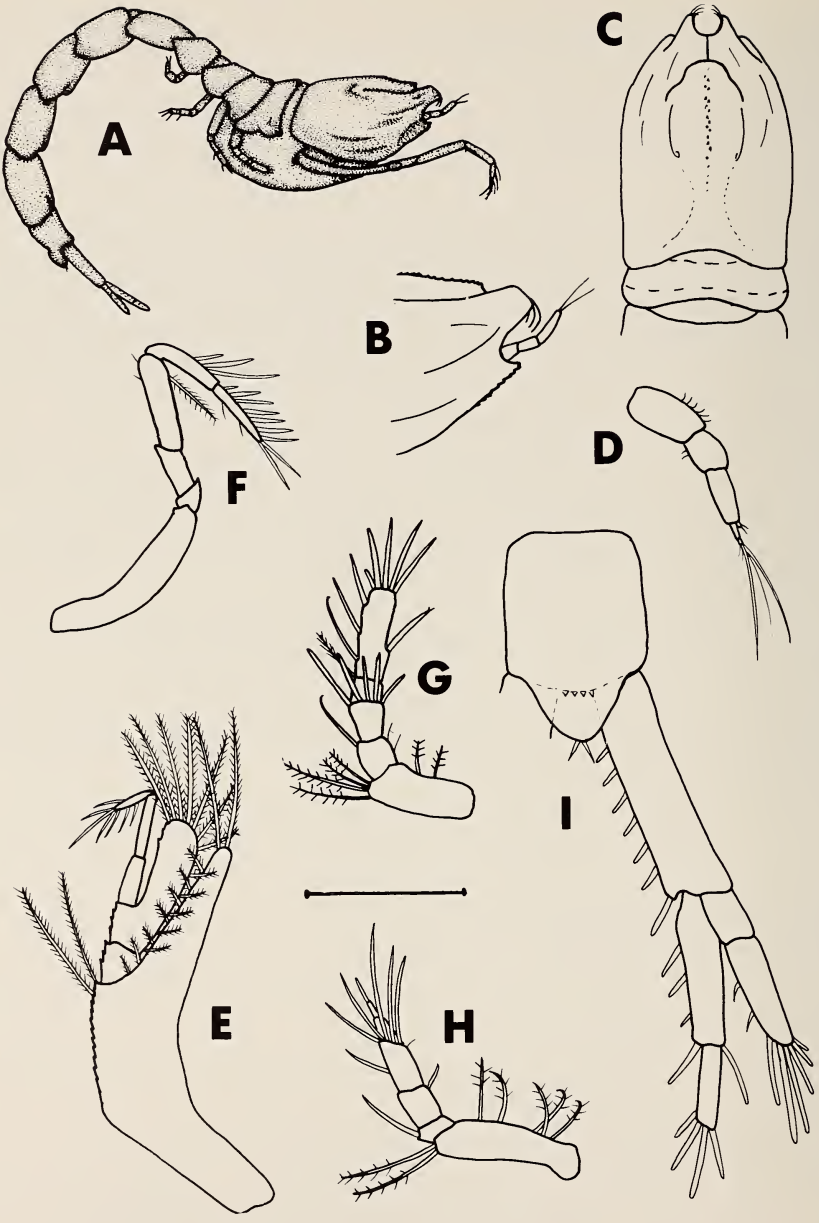

Fig. 26. *Iphinoe crassipes*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2 mm for A; 1 mm for B–C, F; 0,5 mm for D–E, G–I.

segment of endopod nearly twice length of second, armed with four spines on inner edge and one distally on outer edge. Second segment narrower than first with four strong distal spines.

Adult male, length 7,8 mm, from UCT's SCD programme near Knysna. As female, except as follows: anterolateral angle and antennal notch wanting (Figs 27A & B). Serrations of middorsal carina of carapace much less distinct. Eye (Fig. 27C) well developed, consisting of a single large central lens surrounded by eight smaller ones, with pigment below.

Antenna 1 (Fig. 27D) stouter, flagellum bearing about nine short aesthetascs. Prolongation of basis of maxilliped 3 (Fig. 27E) shorter and broader, of merus wider, distally reaching articulation of propodus and dactyl. Peduncle

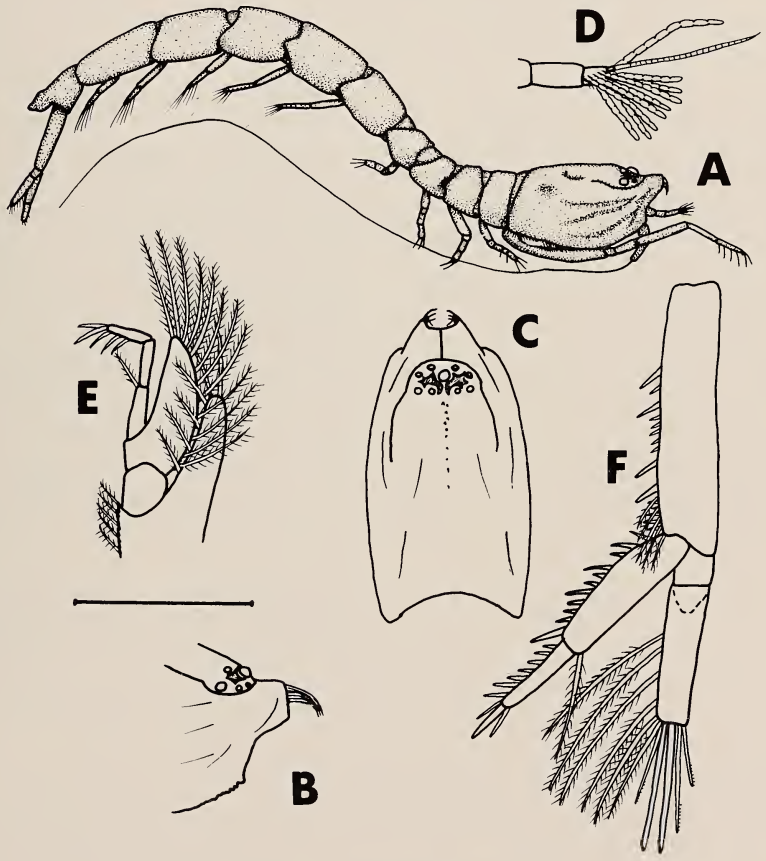

Fig. 27. *Iphinoe crassipes*

Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Distal tip of maxilliped 3. F. Uropod.

Scale line = 2 mm for A; 1 mm for B–C; 0,5 mm for E–F; 0,3 mm for D.

of uropod (Fig. 27F) armed with fourteen spines on inner edge and five small plumose setae distally. First segment of exopod shorter relative to second with six very long plumose setae on inner edge. First segment of endopod with eleven stout spines on inner edge, second with seven.

Length

Adult male	5,7–8,1 mm
Ovigerous female	5,6–7,8 mm

Remarks

The relationship between *I. crassipes* Hansen, 1895, and *I. macrobrachium* Calman, 1904*a*, has never been satisfactorily determined. *I. crassipes* was described on the basis of a single immature male, 3,2 mm in length, from west Africa. In 1904 Calman described specimens from Ceylon, for which he erected a new species, *I. macrobrachium*. (In his paper he gives the length as 1 mm, but in fact both are about 4,5 mm in length.) He considered his species to be distinct from *I. crassipes*, differing mainly in 'the outline of the carapace', the length of the basis of pereiopod 1 and the unequal lengths of the rami of the uropods in his specimens. Stebbing (1910) described a single adult male from South Africa which he called *I. crassipes* (although it exhibited some of the characters used by Calman to differentiate *I. macrobrachium* from Hansen's species), considering the differences between Calman's and Hansen's specimens to be due solely to sexual dimorphism between obviously immature individuals. The author does not have Stebbing's specimen, but it is presumably similar to those in her possession, which are very uniform in structure throughout the range. His figures do not correspond well with any specimens, particularly in the outline of the carapace, the basis of pereiopod 1 and the uropod. Since then Fage (1928), Jones (1956) and LeLoeuff & Intes (1972) have all recorded specimens referred to as *I. crassipes* from west Africa, Jones figuring the previously undescribed female. Kurian (1951, 1954) has recorded some specimens from India and Băcescu (1961) has erected a new subspecies, *I. c. haifae*, for material from the Red Sea.

The question still remains as to whether Stebbing was correct in assuming *I. crassipes* and *I. macrobrachium* to be synonymous. The author has examined Calman's two syntypes and several specimens from P. LeLoeuff's west African material. Despite the striking differences between the figures given by different authors, particularly those of the carapace, the external appearance of the animals is rather uniform throughout the range. In all specimens examined the carapace is characterized by shallow longitudinal furrows on the anterior part. Individuals differ mainly in that in some the eyelobe is elevated above the level of the pseudorostrum, and in others the two are flush with each other; in some the pseudorostrum is clearly upturned and truncate anteriorly while in others it is more or less anteriorly directed and rounded. In all cases the pseudorostal lobes are curled inwards and downwards in dorsal view, with a number of downward-directed spines. The other major variations occur in the first

pereiopods and uropods. The basis of pereiopod 1 varies between a third and nearly half the total length of the limb; the exopod of the uropod may be two-thirds the length of the endopod or the rami may be subequal in length; the first segment of the endopod may be twice the length of the second or the two segments may be of equal length.

Since these variations are not found uniformly throughout the geographical range, the author has come to the conclusion—after some deliberation—that the differences exhibited between individuals from different areas are not consistent enough to warrant the existence of two species or even subspecies. Thus Stebbing was correct in his conclusion although, contrary to his suggestion, few of the differences are sexual. The author also suspects that, from his figures and very brief description, Băcescu's *I. c. haifae* will be found to fit within the range of variability of *I. crassipes* without subspecific differentiation, being very like the West African forms in most respects.

The major variable characters shown by individuals from different regions are tabled below.

Ceylon and India (*I. macrobrachium* sensu Calman)	South Africa (*I. crassipes* sensu Stebbing)	Red Sea (subspecies *I. c. haifae* sensu Băcescu)	West Africa (*I. crassipes* sensu Hansen)
eyelobe strongly elevated in ♀ (no ♂ available)	eyelobe strongly elevated in ♀, slightly in ♂	? eyelobe elevated in ♂ and ♀	eyelobe elevated in ♂, less in ♀
pseudorostrum upturned in ♀	pseudorostrum upturned in ♀, very slightly in ♂	pseudorostrum rounded, ? not upturned	pseudorostrum upturned in ♂, rounded in ♀
distal process of basis of maxilliped 3 reaching distal tip of carpus	distal process of basis of maxilliped 3 reaching at least distal tip of carpus	distal process of basis of maxilliped 3 reaching half-way along carpus	distal process of maxilliped 3 reaching one-third length of carpus
basis of pereiopod 1 three-sevenths total length of limb	basis of pereiopod 1 three-fifths total length of limb	basis of pereiopod 1 half total length of limb	basis of pereiopod 1 less than half total length of limb
endopod of uropod one and a third length of exopod	endopod of uropod one and a half length of exopod	exopod and endopod of uropod subequal in length	
first segment of endopod slightly longer than second	first segment of endopod twice length of second	segments of endopod subequal in length	
peduncle of uropod shorter than endopod	peduncle and endopod subequal in length	penducle of uropod longer than endopod	

It can be seen that in most respects the west African and Red Sea forms are rather similar, as are the South African and Ceylonese forms, but the degree of overlap of distinguishing characters is such that taxonomic differentiation is inappropriate.

I. crassipes is obviously closely related to *I. pokoui* LeLoeuff & Intes, 1972, from West Africa, the only other species bearing long stout first pereiopods and an upturned pseudorostrum. It may be distinguished from *I. crassipes* by

the very wide antennal notch with a narrow serrate elongate anterolateral angle and more slender uropods with subequal rami. Both species are rather aberrant for the genus, the pereiopods and maxilliped 3 having some similarity with those of *Eocuma*. The nature of the carapace and thoracic somites, however, ensures that they remain in the genus *Iphinoe*.

Distribution

India; Ceylon; South Africa: Saldanha Bay (13–29 m) to Natal (23–103 m); Gulf of Guinea; Red Sea. The species is absent from the colder waters of South West Africa, but otherwise probably occurs round the entire Atlantic and Indian Ocean coasts of Africa and India from about 8 to little over 100 m in depth. It constitutes a little more than 3 per cent of the individuals in the collection, but represents more than 70 per cent of the individuals from Natal waters.

Iphinoe truncata Hale, 1953

Fig. 28

Iphinoe truncata Hale, 1953: 48–50, figs 3–4.

Records

			adult ♂	sub-adult ♂	ovig. ♀	♂ & ♀	juv.	total	no. of records
CON	Morrumbene (23°S 35°E)	estuarine plankton		2	3		9	14	5
PEM	Richards Bay (28°S 32°E)		1					1	1
RU	St Lucia (28°S 32°E)			2	5	5	1	13	1
UCT	Keurboom's River (34°S 23°E)		10	4	15	9	5	43	2
UCT	Knysna (34°S 23°E)				2	2		4	1
UCT	Great Brak River (34°S 22°E)				1			1	1

Previous records

Estuarine plankton from: The Haven (32°S 28°E), Port St Johns (31°S 29°E), Umkomaas (30°S 30°E) (Hale 1953); Knysna (34°S 23°E) (Jones 1960).

Holotype

Not designated. Type localities: ovigerous female, Umkomaas River Mouth; adult male, Port St Johns River Mouth; both in sand, estuarine.

Description

Ovigerous female, length 2,8 mm, from Keurboom's River Mouth. Integument translucent, finely spotted with black chromatophores. Carapace one and two-thirds as long as deep (Fig. 28A). Anterolateral angle very small, acute; antennal notch tiny, too small to accommodate first antenna. Distinct mid-dorsal carina present on carapace (Fig. 28B), widening slightly about half-way back along the carapace, and absent on posterior third. Pseudorostral lobes short, barely meeting in front of eyelobe. Eyelobe rounded, eye consisting of large patch of black pigment; no lenses visible.

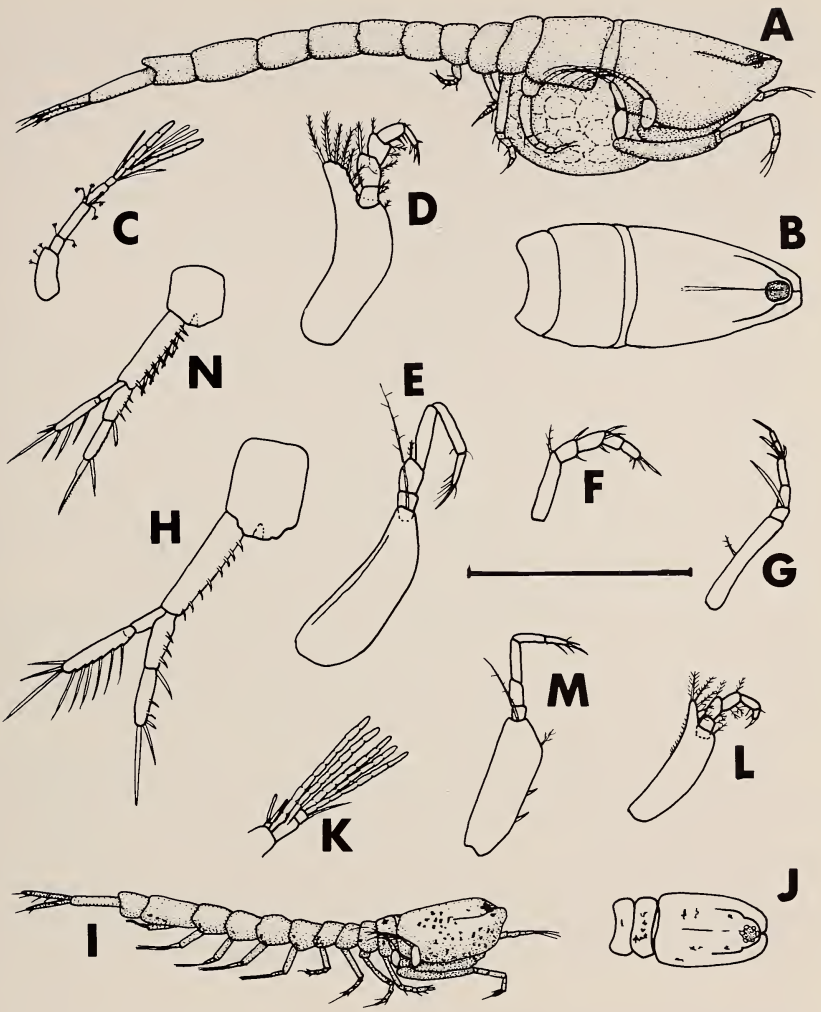

Fig. 28. *Iphinoe truncata*

Ovigerous female. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod. Adult male. I. Lateral view. J. Dorsal view of carapace. K. Detail of distal tip of antenna 1. L. Maxilliped 3. M. Pereiopod 1. N. Telsonic somite and uropod.

Scale line = 1 mm for A–B, J; 0,5 mm for C–I, L–N; 0,1 mm for K.

First pedigerous somite visible, second very wide. Carapace almost as long as free thoracic somites together, cephalothorax as long as abdomen and peduncle of uropod together. Marsupium very large. Exopods of maxilliped 3 and pereiopod 1 large and reflexed upwards.

Antenna 1 (Fig. 28C) fairly long and slender, first segment of basal region short, subequal in length to third. Accessory flagellum very small, 1-segmented. Flagellum 2-segmented, bearing two aesthetascs and a number of fine setae.

Maxilliped 3 (Fig. 28D) short and stout, basis a third as wide as long; prolongation narrow, reaching junction of merus and carpus. Merus and carpus both somewhat expanded.

Basis of pereiopod 1 (Fig. 28E) stout, very slightly longer than rest of limb. Remaining segments also stout, particularly ischium and merus.

Pereiopod 2 (Fig. 28F) 6-segmented, slightly shorter than pereiopod 3, last four segments subequal in length.

Pereiopods 3 (Fig. 28G) to 5 similar, slender. Basis of pereiopod 3 subequal in length to rest of limb, bases of others relatively shorter.

Telsonic somite (Fig. 28H) almost square in dorsal view, notched in midline. Peduncle of uropod slightly longer than telsonic somite with eight small serrated spines on inner edge. Rami subequal in length. First segment of exopod about half length of second, unarmed; second armed with six very slender spines on inner edge and three stouter terminal spines, one very long. Segments of endopod subequal in length, first armed with four spines on inner edge, second with three on inner edge and two terminally.

Adult male, length 1,7 mm, from Keurboom's River Mouth. As in female, except as follows: much smaller in size, fewer chromatophores present. Carapace (Fig. 28I) almost twice as long as deep; anterolateral angle wanting; no antennal notch. First pedigerous somite visible only dorsally, second much narrower. Anterior part of carapace (Fig. 28J) relatively wider.

Flagellum of antenna 1 with five aesthetascs, three around base (Fig. 28K). Basis of maxilliped 3 (Fig. 28L) somewhat narrower, less angled; prolongation narrower. Basis of pereiopod 1 (Fig. 28M) slightly narrower, ischium and merus less stout. Peduncle of uropod (Fig. 28N) armed with twelve spines, second segment of exopod with three spines, second segment of endopod serrated on inner edge with two terminal spines, one constricted half-way along and serrated distally.

Length

Adult male	1,7–2,5 mm
Ovigerous female	2,5–3,1 mm

Remarks

This species has previously been recorded by Hale (1953) and Jones (1960). Hale described it on the basis of adult females only, although he did also designate an adult male holotype without description. The present specimens are clearly members of Hale's species, not differing from those figured by him in any significant way. This species can be distinguished from others in the genus by the absence of a serrated dorsal carina in conjunction with the rami of the uropods being subequal in length to the peduncle and the very short, stout

bases of maxilliped 3 and pereiopod 1.

The adult males are all considerably smaller than the ovigerous females, and the size of these females varies rather more than is common in the genus.

Distribution

The only bodotriid known in estuaries from Great Brak River to Morrumbene, where it is found in fairly small numbers.

Iphinoe capensis (Zimmer, 1921)

Fig. 29

Bodotria capensis Zimmer, 1921: 123–124, figs 12–14.
Iphinoe brevidactyla Hale, 1953: 145–148, figs 1–2.

Records

			adult ♂	sub-adult ♂	ovig. ♀	♂ & ♀	juv.	total	no. of records
SWD	26°S 15°E	26 m	1		2			3	1
LBT	32°S 18°E	10–13 m	9		3		1	13	8
LB	33°S 18°E	0–2 m	5		2	1	3	11	6
CP*	34°S 18°E	0–2 m	1					1	1
FAL & FBY	34°S 18°E	0–23 m	71	2	1	4	4	82	4**
NIWR	29°S 31°E	30 m			1			1	1

*Kommetjie
**Two records from light-traps

Previous records

'Cape Town' (Zimmer 1921); Langebaan Lagoon (33°S 18°E), 1–3 m (Hale 1953).

Syntypes

Two adult males, deposited by Zimmer (1921) as *Bodotria capensis* in the Berlin Zoologisches Museum. Type locality: 'Cape Town'.

Description

Ovigerous female, length 3,1 mm, from Kalk Bay Harbour, False Bay. Integument translucent, shiny. Carapace (Fig. 29A) more than one and a half times as long as deep, anterolateral angle obtuse, small; antennal notch very shallow (Fig. 29B). Pseudorostral lobes short, rounded. Eyelobe rounded, eye large and distinct with maroon pigment below; three lenses visible (Fig. 29C).

First pedigerous somite very short, second very wide. Carapace subequal in length to free thoracic somites, cephalothorax longer than abdomen by two somites. Abdominal somites cylindrical.

Antenna 1 (Fig. 29D) short; first segment longest and second shortest. Accessory flagellum very small; flagellum short, 1-segmented, with a single short aesthetasc.

Maxilliped 3 (Fig. 29E) stout, basis angled; prolongation short and blunt, hardly reaching level of articulation of ischium and merus. Merus, carpus and propodus all flattened and of equal width. Dactyl short and cylindrical.

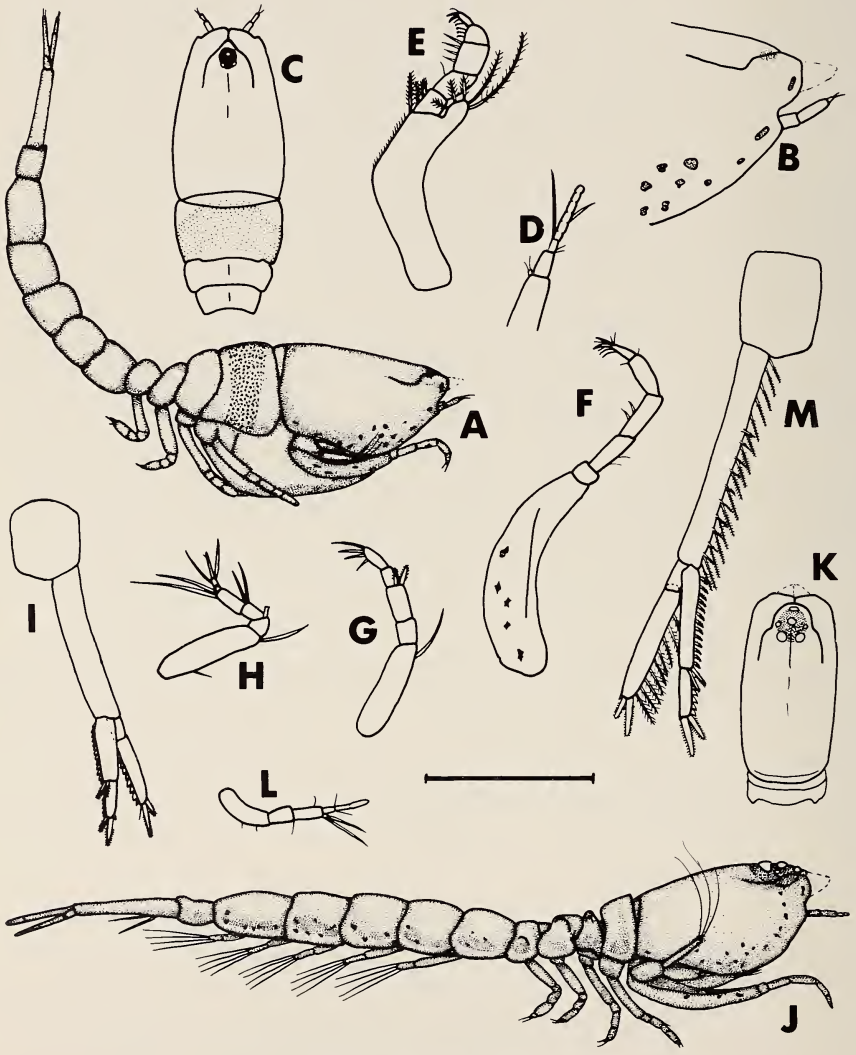

Fig. 29. *Iphinoe capensis*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Detail of distal tip of antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Adult male. J. Lateral view. K. Dorsal view of carapace. L. Antenna 1. M. Telsonic somite and uropod.

Scale line = 1 mm for A, C, J–K; 0,5 mm for B, E–I, L–M; 0,25 mm for D.

Pereiopod 1 (Fig. 29F) short and stout, basis equal in length to remaining segments together. Distal segments stout, cylindrical.

Pereiopod 2 (Fig. 29G) stout, 6-segmented, poorly armed. Dactyl very slightly longer than propodus.

Pereiopods 3 (Fig. 29H) to 5 similar, well armed with long spines on merus, carpus and propodus. Propodus and dactyl very short, relatively stout.

Telsonic somite (Fig. 29I) little produced between uropods, about half length of peduncle. Peduncle about one and a half times length of rami, unarmed. Exopod slightly shorter than endopod, first segment unarmed; second toothed on inner edge with two stout serrated terminal spines. Both segments of endopod toothed on inner edge, first with two stout serrate setae distally, second with two terminally.

Colour in life beige with numerous white chromatophores dorsally, especially on carapace, and melanophores scattered over the body and limbs ventrally, also forming a wide transverse band across second pedigerous somite. White pigment fades rapidly, but melanophores may still be evident after some months or years in alcohol.

Adult male, length 3,8 mm, from Kalk Bay Harbour, False Bay. As female, except as follows: antennal notch (Fig. 29J) less evident. Eye bigger with six large lenses (Fig. 29K). Sideplates of last three pedigerous somites slightly produced laterally, abdominal sideplates produced ventrally.

Aesthetasc of antenna 1 (Fig. 29L) extremely short. Basis of maxilliped 3 slightly longer and less curved. Basis of pereiopod 1 slightly longer and stouter. Peduncle of uropod (Fig. 29M) longer and more slender, bearing sixteen long slender and ten short, stout, serrate setae on inner edge. Second segment of exopod bearing eight very fine plumose setae on inner edge. First segment of endopod with thirteen short, stout serrate spines on inner edge and two larger ones distally; second segment toothed on inner edge with two large, strong serrate spines terminally.

Length

Adult male	3,1–4,3 mm
Ovigerous female	3,1–3,4 mm

Remarks

Zimmer (1921) described *Bodotria capensis* from Cape Town on the basis of two adult males, which he ascribed to *Bodotria* on the basis that only four pedigerous somites were visible. He also stated that the posterior part of the carapace was bounded by a ring or collar. In his diagram this looks very like the first pedigerous somite. Apart from a figure of the whole animal, only the third maxilliped and uropod were figured. As far as can be seen from the description and figures, the specimens in the present collection are identical with his.

Hale (1953) described *I. brevidactyla* from male and female individuals from Langebaan Lagoon. His descriptions and figures tally with those of the

author in all respects except as follows: the adult female is shown with an acutely pointed pseudorostrum (but in some of the present specimens the siphons are calcified and appear as a forward projection of the pseudorostrum); more lenses are visible in the eye of the female; in the female also, the second segment of the uropodal exopod bear four fine setae, whereas the present ones are toothed; in the male the peduncle of the uropod has fewer setae on the inner border than in the present males.

It is noticeable that individuals vary even within a single sample in all these characters, and the differences are minor. so that the present specimens are clearly members of Hale's species.

In fully ovigerous females the first pedigerous somite is quite evident dorsally and dorsolaterally but in others, including most young females and some adult males, the somite is totally invisible. Thus, within one species the main character distinguishing between *Iphinoe* and *Bodotria* becomes obscure. However, even when the first pedigerous somite is not evident, it can be seen on flexing the animal. Thus it seems appropriate to concur with Hale and place the species in *Iphinoe*. It is not then necessary to expand the definition of *Bodotria*, which would cause considerable confusion since the boundaries between the genera are not clear-cut.

I. capensis is easily distinguished from the other species of *Iphinoe* by the very distinctive distal segments of maxilliped 3 and pereiopods 3–5 as well as by the serrations of the second segment of the uropodal endopod.

Distribution

Widely distributed from Lüderitz to Durban at depths from 0 to 50 m, but occurring in rather small numbers. The species constitutes about 2 per cent of the individuals in the collection.

Some specimens were collected by light trap in Kalk Bay Harbour and others were taken very near to Lambert's Bay Harbour. These are both fishing harbours, indicating that the species is resistant to at least some degree of organic pollution.

Cyclaspis Sars, 1865

Generic diagnosis

Carapace variable in shape. Eye present or absent. Four pedigerous somites visible in male, sometimes five in ovigerous females. Second pereiopod 7-segmented. Endopod of uropod 1-segmented.

Type species

C. longicaudata Sars, 1865.

Remarks

A general discussion of the genera of the Bodotriinae is to be found on page 163 in the Introduction. The South African members of *Cyclaspis* are poor

in number both of samples and individuals. In comparison with the warmer waters of the Indo-Pacific region with several tens of species, only three occur in South African waters, and only one other species has been recorded off the rest of Africa. It seems fairly certain that the species occurring here are quite distinct from those from other regions, but the amount of variability in the genus is so great that it is difficult to state with certainty that the species are distinct entities and not genetic variations of species from other regions. Since only three species are known from southern Africa, no key is given. The reader is referred to Hale (1944*a*) for a key to all species known up to that time.

Distribution of Cyclaspis

The genus is a very large and widespread one, representatives being found in all oceans. Of approximately 80 species nearly 60 per cent are found exclusively in Australasian waters, 20 per cent in the Indo-Chinese region and 10 per cent occur around the coasts of the Americas; 3 species occur in South Africa, 1 in east Africa, 3 in European and 2 in Antarctic waters. Fully 57 per cent of the species occur between 20 and 45°S (mainly due to the very great preponderance in Australasian waters) and only 5 per cent north or south of 45°. This indicates that the genus is essentially one of south temperate latitudes.

The majority of species has a depth range from about 10 to 50 m, and almost all are confined to depths less than 100 m. However, a group of morphologically distinct species occurs at much greater depths. These are *C. subgrandis* Jones 1969 (3 290 m off Kenya), *C. tasmanica* Jones, 1969 (610 m in the Tasman Sea), *C. longicaudata* Sars, 1865 (120–3 834 m off Europe), *C. gigas* Zimmer, 1907 (193–640 m in the Antarctic) and *C. spectabilis* Zimmer, 1908 (140–1 300 m off South Africa). *C. sibogae* Calman, 1905, is also a deep-water species, occurring at a depth of 411 m in the Philippine Sea.

Cyclaspis australora sp. nov.

Figs 30–31

Records

SST	34°S 21°E	15 m	1 subadult ♂, 4 ovig. ♀♀ (1 record)
SCD	33°S 25°E	7 m	4 subadult ♂♂, 1 ♀, 3 juvs (1 record)
NIWR	29°S 31°E–27°S 32°E	20–27 m	1 adult ♂, 1 juv. (2 records)

Holotype

Ovigerous female, in the South African Museum, SAM–A15488, collected during the UCT benthic survey, 21 June 1972. Type locality: 21 m, off Still Bay (34°23′S 21°26′E). UCT station number SST 66B.

Description

Ovigerous female, holotype, length 5,6 mm. Integument clean, white, shiny, slightly brittle and translucent with minute reticulations and scattered pits

visible at high magnifications. Carapace (Fig. 30A) oval, one and a half times as long as deep. Anterolateral angle (Fig. 30B) acute, antennal notch fairly small, rounded. Pseudorostral lobes (Fig. 30C) very short, not meeting in front of eyelobe. Eyelobe (Fig. 30D) rounded, eye consisting of eight small lenses

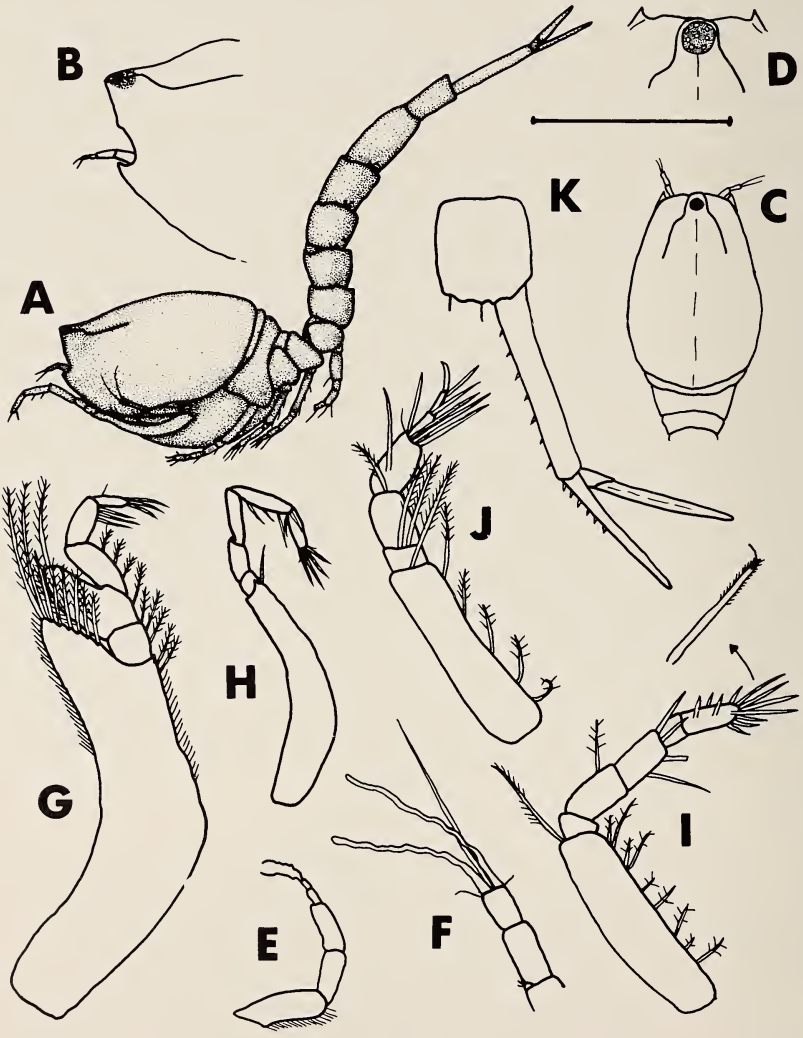

Fig. 30. *Cyclaspis australora* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Detail of eyelobe. E. Antenna 1. F. Detail of distal tip of antenna 1. G. Maxilliped 3. H. Pereiopod 1. I. Pereiopod 2. J. Pereiopod 3. K. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, D, H, K; 0,5 mm for E, G, I–J; 0,1 mm for F

above a red pigmented area. Middorsal region marked by a suture-line, carina hardly present.

First pedigerous somite visible dorsally and dorsolaterally second narrower dorsally than ventrally. Dorsolateral edges of third to fifth pedigerous somites raised. Carapace twice length of free thoracic somites. Cephalothorax and abdomen subequal in length. Abdominal somites cylindrical with small lateral articulatory pegs on second to fifth.

First segment of antenna 1 (Fig. 30E) slightly longer than each of next two. Flagellum 2-segmented with three setae, one rigid and two irregular and flexible. Accessory flagellum (Fig. 30F) minute, 1-segmented.

Basis of maxilliped 3 (Fig. 30G) stout, curved, twice length of rest of limb.
Distal prolongation triangular, reaching half-way along merus. Outer distal portion of merus expanded, reaching junction of carpus and propodus.

Basis of pereiopod 1 (Fig. 30H) curved, equal in length to rest of limb. Remaining segments stout, propodus longest.

Pereiopod 2 (Fig. 30I) 7-segmented. Basis slightly shorter than rest of limb. Ischium short, merus and carpus subequal in length, dactyl twice as long as propodus with eleven sharp serrate spines.

Pereiopods 3 (Fig. 30J) to 5 similar, stout. Merus and carpus subequal in length and as wide as basis.

Telsonic somite (Fig. 30K) square in dorsal view, not produced between uropods, half length of peduncle. Peduncle half as long again as rami with seven very short spines on inner edge. First segment of exopod a quarter length of second, neither armed. Endopod very slightly shorter than exopod with six short spines distally on inner edge.

Adult male, length 6,2 mm, from Natal. As female, except as follows: anterolateral angle and antennal notch rounded (Fig. 31A). Carapace narrower in dorsal view (Fig. 31B). Eye (Fig. 31C) with nine large, clear lenses. Carapace not carinate. Sideplates of abdominal somites ventrally defined posterior to insertion of pleopods only.

Second segment of antenna 1 shorter and stouter, flagellum 1-segmented. Basis of maxilliped 3 less curved. Basis of pereiopod 1 (Fig. 31D) stout, produced to a strong point distally; subsequent segments more slender. Basis, merus and carpus of pereiopod 2 a little shorter. Bases of pereiopods 3 to 5 shorter. Telsonic somite (Fig. 31E) slightly longer. Peduncle of uropod with twelve short and seventeen long serrate spines on inner edge as well as three dorsally on proximal half. Endopod with twenty-three short spines on inner edge. Second segment of exopod with seven very small spines on inner edge.

Length

Adult male	6,2 mm
Ovigerous female	5,4–5,6 mm

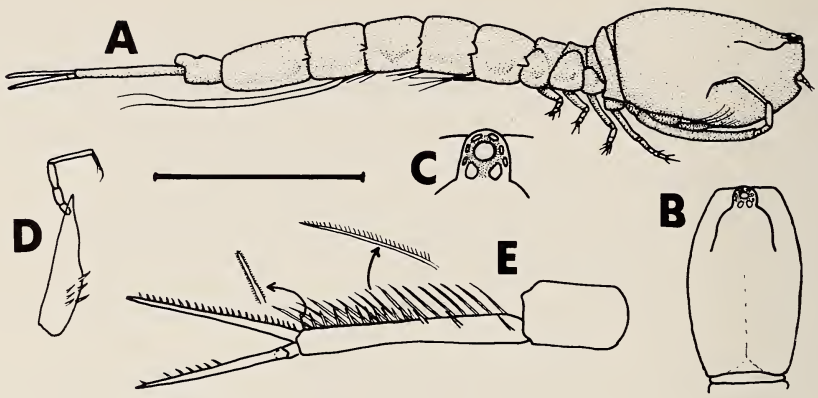

Fig. 31. *Cyclaspis australora* sp. nov.
Adult male. A. Lateral view. B. Dorsal view of carapace. C. Detail of eyelobe. D. Pereiopod 1. E. Telsonic somite and uropod.
Scale line = 2 mm for A–B, D; 1 mm for C, E.

Remarks

C. australora is one of the three species of *Cyclaspis* occurring in southern African waters. It may be distinguished from *C. spectabilis* by its very much longer and more slender uropods and from *C. scissa* by the lack of a transverse groove across the carapace.

It apparently falls within Hale's (1944*a*) *levis* group, most closely resembling a number of unsculptured Indo-Pacific species. Within this group only *C. australora* and *C. herdmanni* Calman, 1904*a* have the basis of pereiopod 1 subequal in length to the rest of the limb. Comparison with the syntypes of *C. herdmanni* shows a number of significant differences between the two species. *C. australora* is about twice the size of *C. herdmanni*; the anterior face of the carapace is perpendicular in *C. australora* and normally slanted in *C. herdmanni*. The distal prolongation of the basis of pereiopod 1 is shorter, while the whole limb is longer in *C. australora*; the uropods are equal in length to the last three somites together and the peduncle is nearly one and a half times the length of the rami in *C. australora*, while in *C. herdmanni* the uropods are little longer than the last two somites together and the peduncle is subequal in length to the rami.

Distribution

Apparently endemic to the warmer waters of the south-eastern coast of Africa from Still Bay to northern Natal at depths from 9 to 27 m; not a common species.

Cyclaspis scissa sp. nov.

Fig. 32

Records

NIWR 30°S 30°E–29°S 31°E 15–52 m 1 subadult ♂, 1 immature ♂, 2 ♀♀ (3 records)

Holotype

Young female, in the South African Museum, SAM–A15489, collected by the NIWR, 19 November 1973. Type locality: 15 m, off Durban (29°53′S 31°04′E). NIWR station number BL D1(G).

Description

Young female, holotype, length 5,8 mm. Integument white, velvety, with fine reticulations interspersed with scattered pits visible at high magnifications. Carapace (Fig. 32A) oval in outline with a sharply-delineated groove running transversely from middorsal region to ventral edge of carapace, ending a little behind the anterolateral angle and a small indentation dorsolaterally on either side slightly anterior to the major groove. Anterolateral angle small and acute, antennal notch small, semicircular. Pseudorostral lobes (Fig. 32B) short, ending level with eyelobe. Eyelobe (Fig. 32C) rounded, bearing three transparent lenses with reddish pigment below. Middorsal carina not strongly evident, most marked anteriorly.

First pedigerous somite not visible, second narrow, third and fifth with sideplates defined dorsolaterally. Free thoracic somites less than half length of carapace, cephalothorax slightly shorter than abdomen. Abdominal somites almost cylindrical with sideplates poorly defined ventrally. Articulatory pegs present on abdominal somites 1–5.

Antenna 1 (Fig. 32D) elongate, first segment geniculate, longer than second and third together. Flagellum 2-segmented bearing a single unmodified seta. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 32E) nearly twice length of rest of limb, inner part strongly calcified where exposed ventrally. Distal elongation reaching articulation between merus and carpus. Outer edge of merus widely expanded, distal tip reaching articulation of carpus and propodus.

Pereiopod 1 (Fig. 32F) elongate, reaching tip of pseudorostrum with carpus. Basis subequal in length to rest of limb. Merus slightly shorter than subequal propodus and dactyl.

Pereiopod 2 missing.

Pereiopods 3 (Fig. 32G) to 5 similar, stout. Ischium small, merus and carpus both relatively wide, strong, subequal in length.

Telsonic somite (Fig. 32H) protruding between uropods for about a third its length, one and a half times as long as broad. Peduncle of uropod less than one and a half times length of telsonic somite, unarmed except for three small

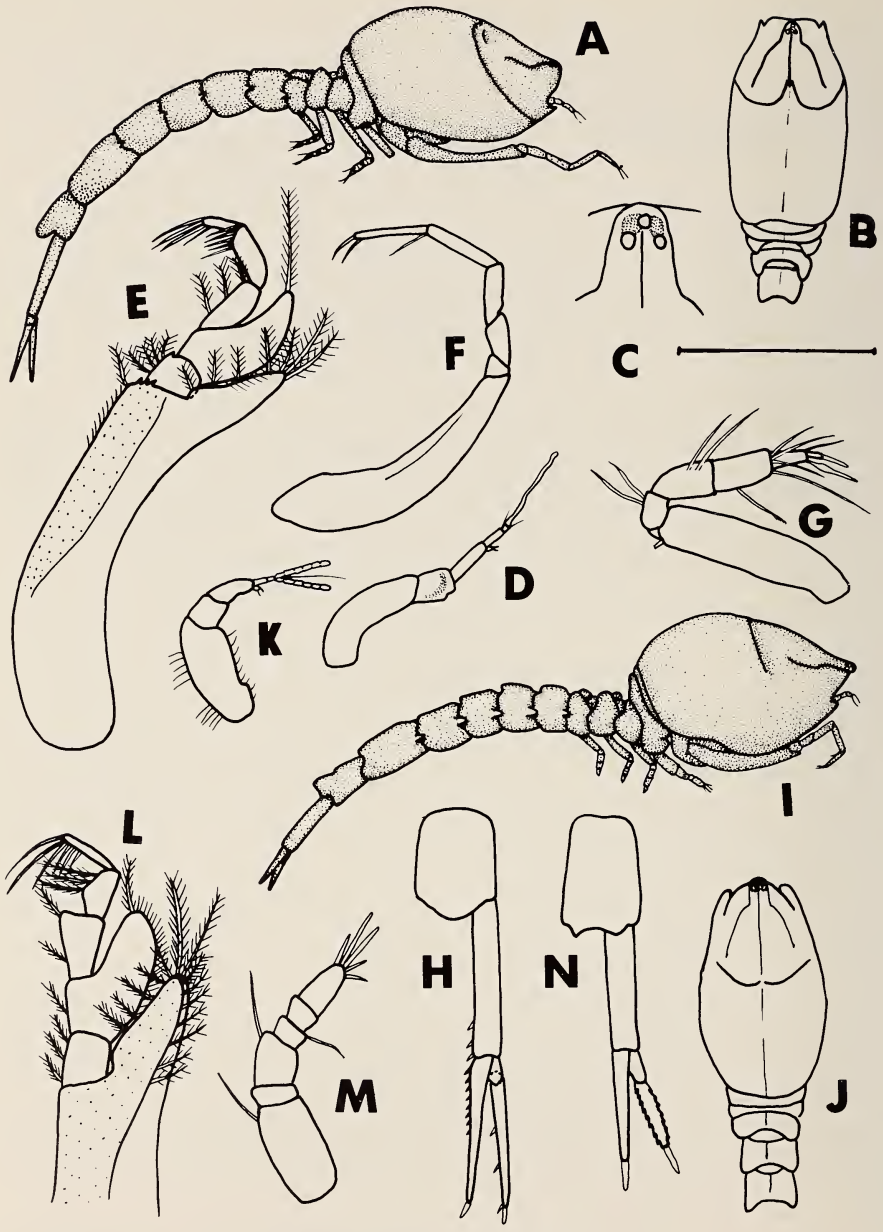

Fig. 32. *Cyclaspis scissa* sp. nov.

Young female, holotype. A. Lateral view. B. Dorsal view of carapace. C. Detail of eyelobe. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 3. H. Telsonic somite and uropod.

Young male. I. Lateral view. J. Dorsal view of carapace. K. Antenna 1. L. Detail of distal tip of maxilliped 3. M. Pereiopod 2. N. Telsonic somite and uropod.

Scale line = 2 mm for A–B, I–J; 1 mm for F, H, N; 0,5 mm for C–E, G, K–M.

spines distally on inner edge. Endopod 1-segmented with eight small spines on inner edge and one terminally. First segment of exopod about a quarter length of second, unarmed; second with three very small spines on inner edge and one terminally.

Young male, length 5,8 mm, from Natal. (Note: a single subadult male is too badly damaged for descriptive purposes.) As female, except as follows: carapace (Fig. 32I) more vaulted posteriorly, transverse groove present only on dorsal half of carapace. Anterolateral angle rounded. Eyelobe (Fig. 32J) protruding between pseudorostral lobes, pigmented area larger.

Antenna 1 (Fig. 32K) shorter and stouter, with two aesthetascs. Greater part of basis of maxilliped 3 (Fig. 32L) exposed ventrally, carpus and propodus both slightly expanded internally. Pereiopods 2 (Fig. 32M) stout, relatively short. Ischium wider than long, merus large, carpus and propodus short, subequal in length. Dactyl with a few terminal spines. Abdominal somite protruding less between uropods. Peduncle (Fig. 32N) shorter and stouter, unarmed. Second segment of exopod clearly serrated on inner and outer margins, first segment relatively longer. Endopod unarmed.

Length

Subadult male	6,3 mm
Young female	5,8 mm

Remarks

C. scissa may be distinguished from all other southern African bodotriids by the strong transverse groove on the carapace of both sexes. It most closely resembles *C. uniplicata* Calman, 1904*a*, *C. longipes* Calman, 1904*a* and *C. nubila* Zimmer, 1936. In *C. longipes* there is no transverse groove and the basis of pereiopod 1 is considerably shorter than the rest of the limb; in *C. nubila* the basis of pereiopod 1 is considerably longer than the rest of the limb, and there is no transverse groove. *C. uniplicata* does possess a groove but anterior to it is a very distinctive middorsal tooth, the basis of pereiopod 1 is about a third the total length of the limb, which is slender.

Distribution

Four specimens known from the south coast of Natal at depths from 15 to 52 m.

Cyclaspis spectabilis Zimmer, 1908

Fig. 33

Cyclaspis spectabilis Zimmer, 1908: 161–162, pl. 1; 1921: 124.

Records

SAM	34°S 18°E	460–560 m	1 subadult ♂
SAM	27°S 32°E–30°S 30°E	680–1 300 m	2 subadult ♂♂, 1 ♂, 11 juvs, 6 mancas (5 records).

Previous records

Holotype only.

Holotype

Ovigerous female, deposited by Zimmer (1908) in the Berlin Zoologisches Museum. Type locality: 565 m, Agulhas Bank (35°S 18°E).

Description

Subadult male, length 7,8 mm, from material collected by the S.S. *Pieter Faure* off the Cape Peninsula. Handsome, integument appearing polished. Carapace (Fig. 33A) almost spherical, nearly as deep as long or wide. Antero-lateral angle rectangular, very slightly serrate below (Fig. 33B). Antennal notch rectangular, shallow. Eyelobe (Fig. 33C) pointed anteriorly, eyeless. Pseudo-rostral lobes very short, just meeting in front of eyelobe. Second pedigerous somite firmly fused with carapace, last three narrow.

Carapace more than twice as long as free thoracic somites together, cephalothorax shorter than abdomen. Abdominal somites cylindrical, each slightly constricted anteriorly, with lateral articulatory pegs present on somites 1–4 anteriorly.

Antenna 1 (Fig. 33D) short, basal segments subequal in length. Flagellum (Fig. 33E) 2-segmented with two long aesthetascs. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 33F) stout, about three times length of rest of limb; distal prolongation widely triangular, reaching more than half-way along carpus. Merus and carpus both expanded externally, distal tip of merus reaching half-way along carpus.

Pereiopod 1 (Fig. 33G) reaching beyond anterior tip of carapace. Basis wide and stout, shorter than remaining segments together.

Pereiopod 2 (Fig. 33H) 7-segmented. Basis equal in length to next four segments together. Lower edge of dactyl slightly serrate with three terminal spines.

Pereiopods 3 (Fig. 33I) to 5 similar, basis and carpus of pereiopod 3 longest.

Pleopods (Fig. 33J) not setose.

Telsonic somite (Fig. 33K) subequal in length to preceding somite, more than twice length of peduncle of uropods, produced between them for more than a quarter its length. Peduncle hardly twice as long as broad, unarmed. Rami subequal in length, about twice length of peduncle. Endopod 1-segmented, unarmed. Exopod 2-segmented, first segment about a fifth length of second, unarmed; second serrated on inner edge but lacking spines or setae.

Length

Subadult male 7,8–8,8 mm

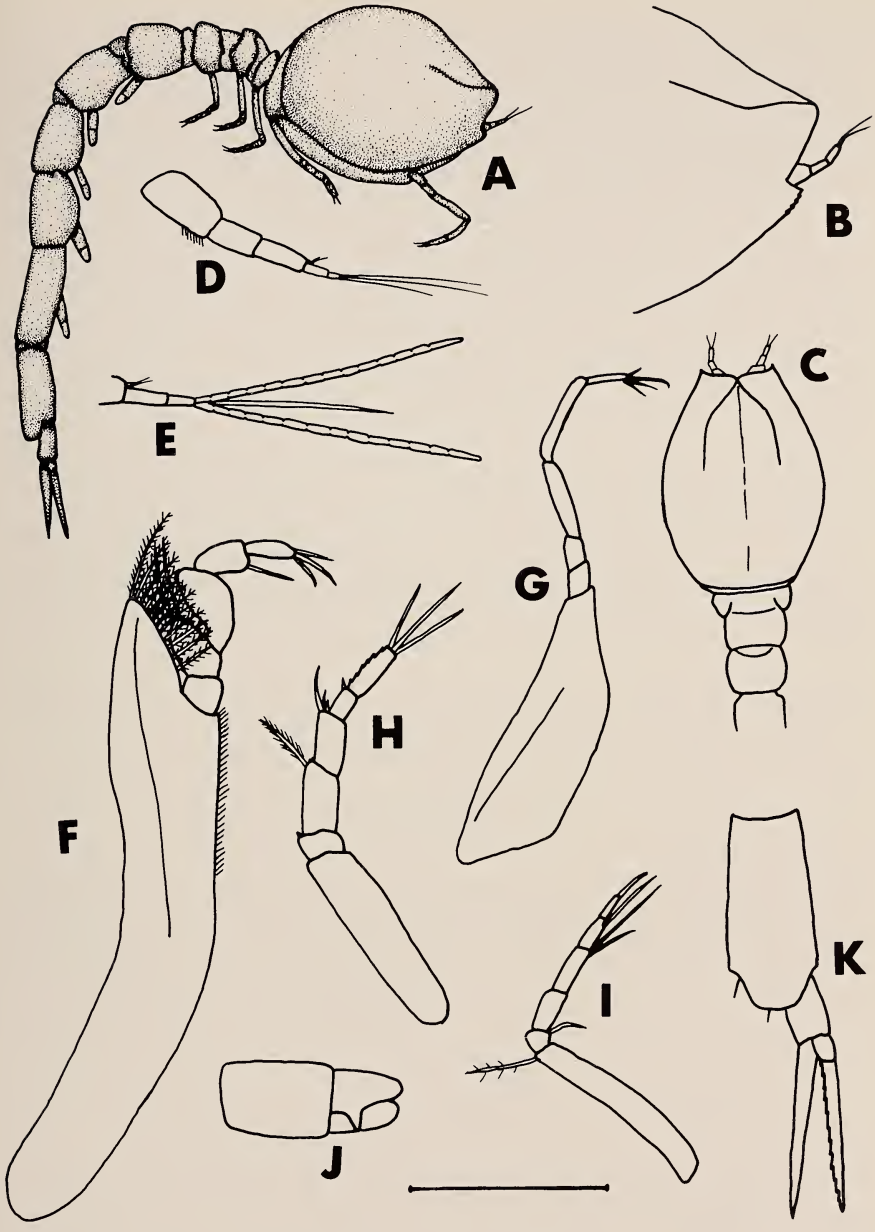

Fig. 33. *Cyclaspis spectabilis*

Subadult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Detail of distal tip of antenna 1. F. Maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Pleopod. K. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, G; 0,5 mm for D, F, H–K; 0,2 mm for E.

Remarks

Zimmer (1908) described *C. spectabilis* from 'several . . . females' collected by the Deutsches Tiefsee-Expedition from 565 m off the Cape Peninsula, and a single, dried specimen from about 140 m on the Agulhas Bank. His specimens were all females while all those in the present collection are subadult males, juveniles and mancas. Thus it is difficult to state with certainty that the specimens in the author's possession are indeed the same species as Zimmer's, although the differences between them and his figures are consistent with sexual variations within a species. The subadult males differ from those figured by Zimmer as follows: the males have no transverse suture across the carapace; the basal segment of antenna 1 is shorter; the prolongations of the basis and merus of maxilliped 3 are slightly more expanded; the carpus and propodus of pereiopod 1 are slightly shorter and the uropods slightly longer. In other respects they are very similar.

The combination of an almost spherical carapace and very short uropods is unique in the South African bodotriid fauna. *C. spectabilis* is very similar to a number of deep-water species: *C. tasmanica*, *subgrandis*, *gigas* and *longicaudata*. It may be distinguished from the latter two species by their longer uropodal peduncles and from the former two by their more laterally compressed carapaces.

Distribution

Fairly common in deep waters from the Cape Peninsula to the southern Mozambique Channel at depths from 140 to 1 300 m.

Bodotria Goodsir, 1843

Generic diagnosis

Carapace often with lateral carinae. First pedigerous somite not visible, second moderately wide in male and very wide in female. Second pereiopod 6-segmented. Peduncle of uropod much longer than rami; endopod 1- or 2-segmented.

Type species

Bodotria arenosa Goodsir, 1843

Remarks

The genus *Bodotria* at present consists of about forty species, most of which are clearly very closely related to each other. The most characteristic feature of the majority is the presence of at least one pair of lateral carinae on the carapace, frequently extending along the pedigerous somites and sometimes the abdomen as well. The integument is usually strongly calcified and brittle, the animals appearing heavy and compact. Due to the fact that in most species the details of the sculpturing of the carapace are variable both between and

within the sexes, it is not always easy to define the limits of each species. As a result, unless large numbers of individuals are available, there is danger of variable species being split into several species, at least until the extent of variation is known. Thus the whole genus is in serious need of revision and until such time as this is done the distinctness of many species must remain in question. This probably applies equally to the new species described here.

Distribution of Bodotria

All forty-odd species of *Bodotria* so far described are from the Eastern hemisphere. 8 species are known from Indo-China or Australia and 15 from Japan (although it is likely that some of the latter will prove to be synonymous). Of the 5 species known from the Red Sea and the Mediterranean, 3 also occur in the colder waters off Norway and the British Isles; 2 of these (*B. pulchella* and *B. scorpioides*) are very widespread, being found off the west African coast as well. The western and southern coasts of Africa are very rich in species, 20 having been described so far (including those in the paper by LeLoeuff & Intes (in press)). 10 species are apparently endemic to southern Africa, 7 to west Africa, and 1 occurs on the geographic boundary of 20°S.

All species but one are confined to depths less than 120 m, *B. tenuis* sp. nov. occurring between 78 and 550 m in the southern Mozambique Channel. This is also the northernmost record on the east coast of Africa.

KEY TO THE AFRICAN AND EUROPEAN SPECIES OF BODOTRIA

Note: the differences between many of the species of *Bodotria*, although constant in large numbers of individuals, are none the less so minor that a number of polymorphic species may well have been described under more than one name. Since only South African material has been available for study, no attempt has been made to group species from other areas. Each species has been keyed according to the most apparently satisfactory descriptions and figures in the literature.

1 Endopod of uropod 1-segmented in female at least (and in all males except *B. laevigata*)...2
– Endopod of uropod 2-segmented in both sexes....5
2 Carapace with no trace of lateral ridges or carinae in either sex (endopod of uropod 2-segmented in male)....*laevigata* LeLoeuff & Intes, in press—west Africa
– Lateral carinae present on part of carapace at least....3
3 Lateral carina present on anterior of carapace only....*glabra* Jones, 1955—west Africa
– Lateral carina reaching posterior border of carapace....4
4 Basis of pereiopod 1 subequal in length to rest of limb; lateral carina widely produced making width of carapace subequal to length....*alata* Băcescu, 1975—Red Sea
– Basis of pereiopod 1 much longer than rest of limb; lateral carina not widely produced... *arenosa* Goodsir, 1843—Norway, Mediterranean
5 Carapace without lateral carinae....6
– Carapace with lateral carinae....7
6 Integument rugose; anterolateral angle not produced anterior to tip of pseudorostral lobes; basis of pereiopod 1 less than one and a half times length of rest of limb.... *magna* Zimmer, 1921—southern Africa
– Integument smooth; antero-lateral angle produced anteriorly as far as tip of pseudorostral lobes; basis of pereiopod 1 nearly twice length of rest of limb....*nitida* sp. nov.

7 A single lateral carina on carapace 8
– Carapace with two lateral carinae, or lower edge of midlateral depression forming an angular ridge as second carina 17
8 Carina extending hardly more than half length of carapace 9
– Carina extending along full length of carapace, or absent only at extreme anterior tip ... 10
9 Second pedigerous somite in female elevated to a point middorsally, fourth and fifth not elevated in either sex ..... *elevata* Jones, 1960—South Africa
– Second pedigerous somite not elevated in either sex, fourth and fifth elevated to points middorsally on both sexes, more so in female .... *vertebrata semicarinata* sp. et subsp nov.
10 Endopod of uropod less than half length of peduncle 11
– Endopod of uropod at least half length of peduncle 12
11 Third pedigerous somite abruptly lower than second in lateral view; endopod of uropod about a third length of peduncle ..... *cribaria* LeLoeuff & Intes, 1972—west Africa
– Pedigerous somites sloping gently in lateral view, third not abruptly lower than second; endopod of uropod slightly less than half length of peduncle ..... *scorpioides* (Montagu, 1804)—west Africa, Europe
12 Some or all of pedigerous somites strongly elevated middorsally 13
– Pedigerous somites not elevated middorsally 14
13 Integument squamous; second and third pedigerous somites strongly elevated middorsally, forming an enormous point in female or rectangular plate in male; abdominal somites not elevated ..... *gibba* (Sars, 1879)—Mediterranean
– Integument smooth; second and third pedigerous somites not elevated middorsally; fourth and fifth pedigerous and first abdominal somites at least elevated to points middorsally ..... *vertebrata vertebrata* sp. et subsp. nov.
14 Prolongation of basis of maxilliped 3 pointed distally, reaching level of carpus 15
– Prolongation of basis of maxilliped 3 rounded distally, not reaching level of carpus 16
15 Lateral carina dorsal to midlateral line; carapace nearly twice as long as deep ..... *intermedia* LeLoeuff & Intes, in press—west Africa
– Lateral carina midlateral; carapace less than one and a half times as long as deep ..... *montagui* Stebbing, 1912—South Africa
16 Carpus of pereiopod 1 very stout, less than three times as long as broad, with spines on lower edge; carapace of female wider than long ..... *falsinus* sp. nov.
– Carpus of pereiopod 1 more than three times as long as broad, lower edge without spines; carapace of female and male longer than wide ..... *serica* sp. nov.
17 Lower carina very distinct, much longer than upper, curving strongly to meet it at posterodorsal corner of carapace ..... *pulchella* (Sars, 1879)—Europe, west Africa
– Lower carina no longer than upper, forming lower edge of midlateral depression, interrupted half-way along if curved, or meeting anterior to posterodorsal corner 18
18 Second and fourth pedigerous somites produced to form narrow, plate-like middorsal keel; gap between distal prolongation of basis of maxilliped 3 and ischium ..... *clara* sp. nov.
– Second and fourth pedigerous somites not platelike dorsally, no gap between prolongation of basis and ischium of maxilliped 3 19
19 Rami of uropods more than half length of peduncle 20
– Rami of uropods half length of peduncle or less 21
20 Basis of maxilliped 3 twice length of remaining segments together; major carina dorsolateral ..... *lata* Jones, 1956—west Africa
– Basis of maxilliped 3 nearly two and a half times length of remaining segments together; major carina apparently midlateral ..... *australis* Stebbing, 1912—South Africa
21 Carinae meeting in front of posterior border of carapace to form a deep depression ..... *bineti* LeLoeuff & Intes, in press—west Africa
– Carinae not meeting 22
22 Basis of pereiopod 1 one and a half times length of rest of limb ..... *armoricana* LeLoeuff & Intes, in press—west Africa
– Basis of pereiopod 1 equal in length to rest of limb 23
23 Carapace less than twice as long as deep; propodus of pereiopod 1 longer than carpus or dactyl ..... *africana* Zimmer, 1921—West Africa
– Carapace more than twice as long as deep; propodus of pereiopod 1 subequal in length to dactyl, shorter than carpus ..... *tenuis* sp. nov.

Bodotria clara sp. nov.

Figs 34–35

Records

FAL	34°S 18°E	2–4 m	1 adult ♂, 1 ovig. ♀ (2 records)
SCD	33°S 25°E	7 m	1 adult ♂

Holotype

Adult male, in the South African Museum, SAM–A15481, collected during the UCT benthic survey, 5 February 1962. Type locality: 7 m, off Port Elizabeth (33°52′S 25°38′E). UCT station number SCD 383L.

Description

Adult male, *holotype*, length 2,6 mm. Integument thick, white, brittle, with many large pits. Carapace (Fig. 34A) one and a half times as long as deep, dorsal outline irregular in lateral view. Sharp dorsolateral carina running from eyelobe to posterior edge of carapace, abruptly elevated in three steps, joined near posterior border by second carina running ventrally and then anteriorly for a short distance, continued forward as slight fold and distinct again on anterior third of carapace, reaching point of anterolateral angle. Anterolateral angle acute, bluntly rounded. Antennal notch narrow and deeply indented. Carapace in dorsal view (Fig. 34B) slightly longer than wide, pseudorostral lobes meeting for short distance in front of eyelobe. Eyelobe rounded, eye visible as two lenses laterally above some pigment. No middorsal carina on carapace.

Second pedigerous somite produced to form very distinct plate-like middorsal carina and a pair of lateral ridges, the latter forming strongly marked sideplates, excavated anteriorly by continuations in pits of integument. Third pedigerous somite elevated slightly, dorsally only; fourth strongly elevated middorsally forming thin median plate and produced into a pair of carinae laterally; last elevated middorsally only and somewhat excavate posteriorly. Free thoracic somites together little more than half length of carapace. Cephalothorax and abdomen subequal in length. Abdominal somites large, as deep as long, sideplates strongly defined ventrally; middorsal carina evident on first and second; third to fifth with lateral articulatory pegs.

Antenna 1 (Fig. 34C) short, first segment twice length of next two together. Flagellum (Fig. 34D) 1-segmented with one aesthetasc and three fine setae. Accessory flagellum 1-segmented with one aesthetasc.

Basis of maxilliped 3 (Fig. 34E) strongly angled distal to midpoint, more than twice length of remaining segments together; distal prolongation narrow, reaching half-way along merus. Merus slightly expanded, distal tip reaching half-way along carpus.

Pereiopod 1 (Fig. 34F) very stout, basis curved, more than twice length of rest of limb with four small spines half-way along on median edge. Ischium very

short, merus and carpus subequal in length, as are propodus and dactyl.

Pereiopod 2 (Fig. 34G) fairly stout, 6-segmented. Basis shorter than rest of limb. Merus slightly shorter than carpus, propodus half length of dactyl.

Pereiopods 3 (Fig. 34H) to 5 similar, basis of pereiopod 3 longest. Merus and carpus very stout, merus curved.

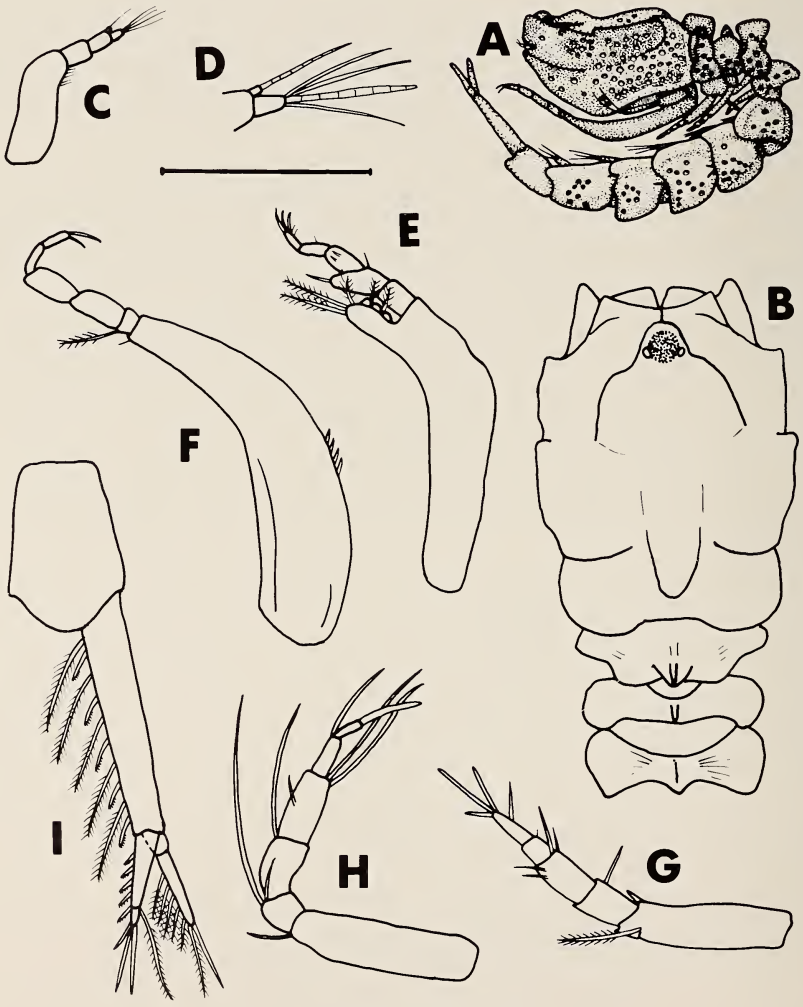

Fig. 34. *Bodotria clara* sp. nov.

Adult male, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Detail of distal tip of antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 1 mm for A; 0,5 mm for B, C, E–I; 0,2 mm for D.

Telsonic somite (Fig. 34I) longer than wide, slightly produced between uropods. Peduncle of uropod nearly half as long again as telsonic somite with five long plumose setae and five serrated spines on inner edge. Exopod slightly longer than endopod, less than half length of peduncle. First segment half length of second, unarmed; second with five plumose setae on inner edge, one long plumose seta and one long slender spine terminally. First segment of endopod nearly four times length of second with five serrate setae on inner edge and one plumose seta distally on outer edge; second with three fine spines terminally.

Ovigerous female, length, 1,9 mm, from False Bay. As male, except as follows: integument softer, poorly calcified, with smaller, less evident pits. Lower lateral carina of carapace (Fig. 35A) not joining upper, longer and more marked, anterior part not reaching anterolateral angle. Anterolateral angle sharper. Carapace wider ventrally than dorsally (Fig. 35B). Eye indistinct. Second pedigerous somite much wider, sideplates of fourth more distinct, fifth not elevated. Abdominal somite smaller.

First segment of antenna 1 (Fig. 35C) shorter, both flagella (Fig. 35D) without aesthetascs. Basis of maxilliped 3 (Fig. 35E) wider, more strongly

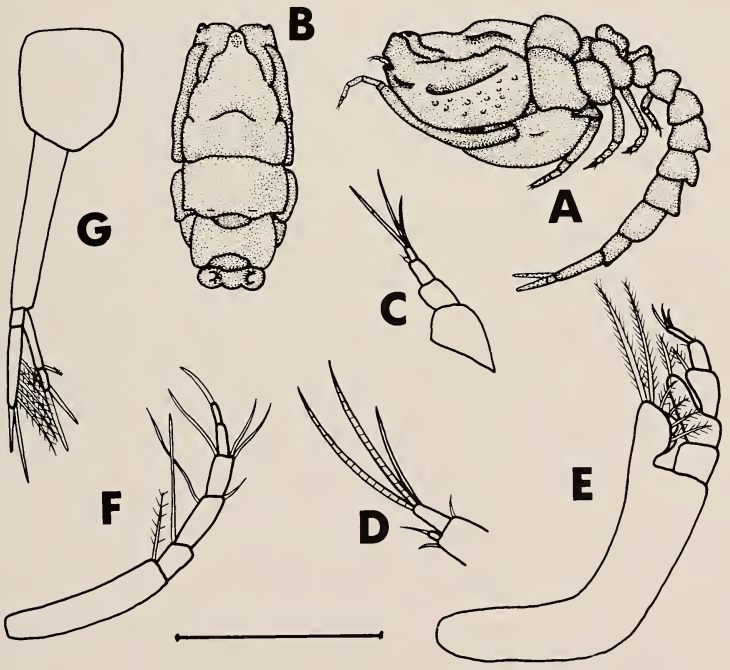

Fig. 35. *Bodotria clara* sp. nov.

Ovigerous female. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Detail of distal tip of antenna 1. E. Maxilliped 3. F. Pereiopod 3. G. Telsonic somite and uropod. Scale line = 1 mm for A–B; 0,5 mm for C, E–G; 0,2 mm for D.

angled, prolongation incised proximally. Merus slightly longer, carpus slightly expanded. Basis of pereiopod 1 shorter, less curved, lacking spines. Basis of pereiopod 2 shorter. Merus and carpus of pereiopods 3 (Fig. 35F) to 5 less stout. Telsonic somite (Fig. 35G) shorter. Peduncle of uropod somewhat less than twice length of exopod, unarmed. First segment of endopod with only one spine distally on inner edge, second with two terminally.

Length

Adult male	2,6–2,7 mm
Ovigerous female	1,9 mm

Remarks

The species is unique in the genus in the combination of a strongly pitted integument, the dumb-bell-shaped fourth pedigerous somite and the lateral carina rising in steps towards the posterior end of the carapace. It is reminiscent of *B. gibba* (Sars, 1879), from which it is easily distinguished by the lack of a plate-like median carina on the fourth pedigerous somite, the much longer prolongation of the basis of maxilliped 3 and the extreme elevation of the second pedigerous somite in *B. gibba*.

Distribution

So far only three specimens known, all from False Bay or Algoa Bay (Port Elizabeth), between 2 and 7 m.

Bodotria magna Zimmer, 1921

Fig. 36

Bodotria magna Zimmer, 1921: 121–123, figs 8–11.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
FAL & FBY	34°S 18°E	48–87 m	15	13	1	25	18	16	88	14
SST	34°S 21°E	50–80 m	11	32	2	17	15	34	111	3
SCD	34°S 21°E	67 m				1			1	1

Previous records

'Great Fish Bay' (16°S 11°E), no depth given.

Holotype

Ovigerous female, deposited by Zimmer (1921) in the Berlin Zoologisches Museum. Type locality: 'Great Fish Bay' (16°S 11°E).

Description

Ovigerous female, length 6,0 mm, from False Bay. Integument very rugose, ridges running longitudinally for the most part, most evident on cephalothorax.

Carapace (Fig. 36A) less than one and a half times as long as deep, dorsal outline very gently arched. Antennal notch deeply excavate, anterolateral angle acute, pointed. Eyelobe (Fig. 36B) rounded, eye wanting. Pseudorostral lobes short, not meeting in front of eyelobe. Carapace lacking dorsal and lateral carinae.

Second pedigerous somite slightly elevated above level of carapace, fairly wide. Third to fifth pedigerous somites hardly elevated, with well-developed sideplates. Free thoracic and first two abdominal somites with distinct mid-dorsal carina. Carapace subequal in length to free thoracic somites together, cephalothorax and abdomen subequal in length. Abdominal somites less rugose, sideplates defined ventrally.

Antenna 1 (Fig. 36C) short, first segment longer than next two together. Flagellum 2-segmented with two aesthetascs, accessory flagellum small, 1-segmented.

Basis of maxilliped 3 (Fig. 36D) twice length of remaining segments together, strongly calcified ventrally where exposed (stippled in figure). Distal prolongation broad and of moderate length, reaching articulation of merus and carpus. Merus slightly expanded, carpus cylindrical.

Pereiopod 1 (Fig. 36E) stout, basis slightly longer than remaining segments together, curved. Ischium short, merus and carpus stout, merus twice and carpus three times length of ischium.

Pereiopod 2 (Fig. 36F) stout, 6-segmented. Basis longer than rest of limb. Merus and carpus stout, subequal in length. Propodus and dactyl slender.

Pereiopods 3 (Fig. 36G) to 5 similar, ischium, merus and carpus all stout, dactyl small.

Telsonic somite (Fig. 36H) rectangular in dorsal view, not produced between uropods, little more than half length of peduncle of uropod. Peduncle unarmed, more than twice length of rami. Rami short, exopod slightly shorter than endopod. First segment of exopod a quarter length of second, unarmed; second with four plumose setae on inner edge and two terminally. Endopod 2-segmented, second segment less than half length of first; first with two small spines on inner edge, second with two, and one very stout terminal spine.

Adult male, length 6,3 mm, from False Bay. As female, except as follows: rugosities distinct, but forming more regular honeycomb pattern. Antennal notch shallower (Fig. 36I), anterolateral angle obtuse, rounded. Carapace more elongate, without carinae, but sculpturing absent dorsolaterally, resulting in the formation of a rounded edge. Second pedigerous somite narrower, not elevated; third produced to form a point middorsally. Abdominal sideplates deeper, sideplates more marked ventrally.

Antenna 1 (Fig. 36J) bearing four aesthetascs around flagellum as well as two at tip. Basis of maxilliped 3 less angled, distal prolongation a little longer, merus less expanded and carpus more. Basis of pereiopod 1 less angled, narrower, with about ten sharp spines on inner ventral edge. Carpus not stout. Pereiopod 2 (Fig. 36K) more strongly armed, basis somewhat shorter, dactyl

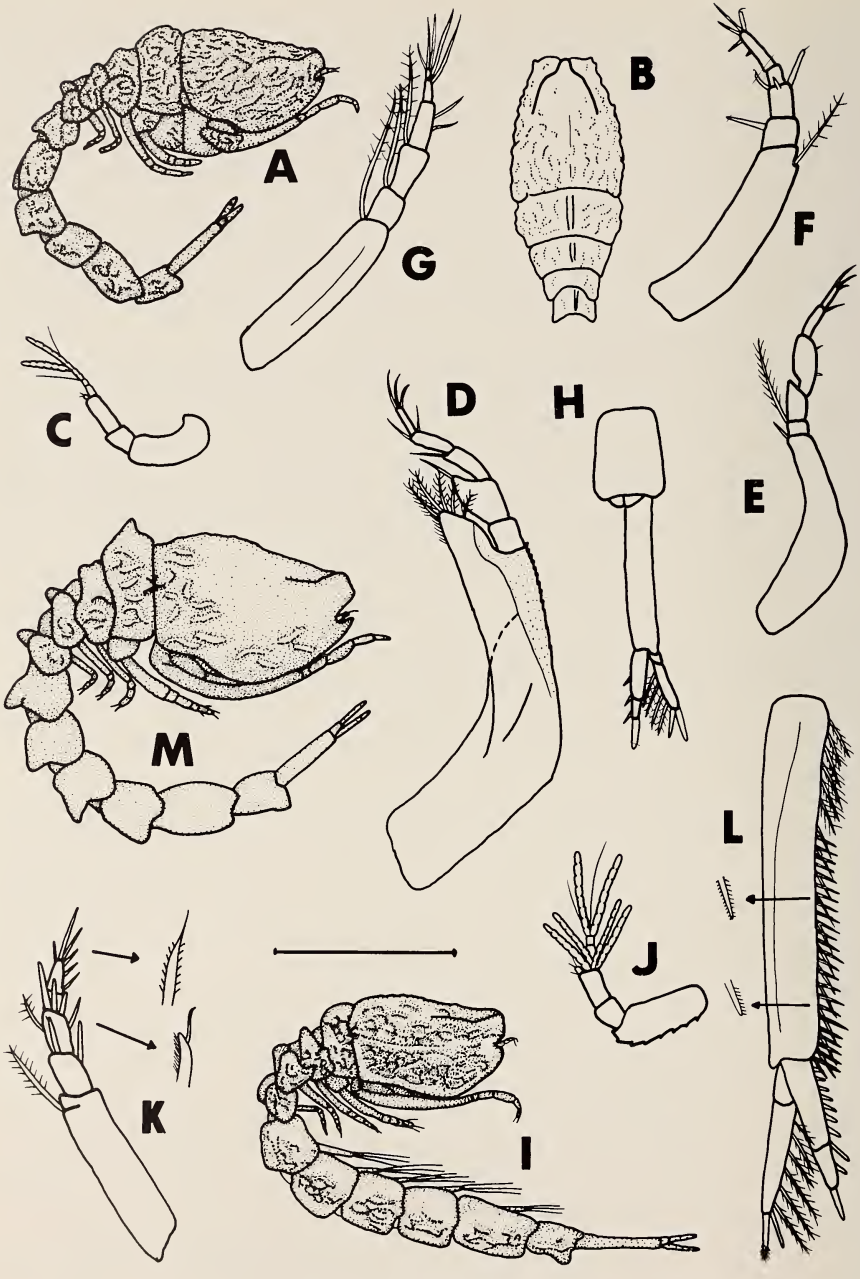

Fig. 36. *Bodotria magna*.

Ovigerous female. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereipod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod.
Adult male. I. Lateral view. J. Antenna 1. K. Pereiopod 2. L. Uropod.
Juvenile. M. Lateral view.

Scale line = 2 mm for A–B, I; 1 mm for E, H, M; 0,5 mm for C–D, F–G, J–L.

shorter and stouter. Inner edge of peduncle of uropod (Fig. 36L) armed with six plumose setae proximally followed by thirty-six sharp serrate setae in two rows. Second segment of exopod with six plumose setae on inner edge and two spines terminally, one with a brush of fine filaments distally. First segment of endopod with eight and second with one blunt seta on inner edge, second terminating in one spine.

Juvenile (Fig. 36M), length 3,1 mm. Integument less calcified, sculpturing restricted to thorax and ventral and posterior regions of carapace, in the form of individual raised ridges—more extensive in some than in others. Second pedigerous somite strongly elevated to a point, last two thoracic and first three abdominal somites also pointed dorsally. The second pedigerous somite is also elevated to a point in *subadult males.*

Length

Adult male	4,3–6,3 mm
Ovigerous female	4,4–6,0 mm

Remarks

Although Zimmer's (1921) description and figures are rather incomplete, this species is quite obviously the same as his *B. magna*, especially since in his description Zimmer mentions the very characteristic sculpturing of the integument. The species is unique in the genus in this respect.

The species nearest to *B. magna* are *B. nitida* sp. nov. and *B. laevigata* LeLoeuff & Intes, in press. In both of these the integument is smooth. The endopod of the uropod in males of *B. laevigata* is 1-segmented and the basis of the first pereiopod in *B. nitida* is longer than that of *B. magna.*

Distribution

A fairly common species, constituting over 4 per cent of the individuals in the collection. It is apparently endemic to the south-western and southern coasts of southern Africa from the mouth of the Kunene River to Still Bay, at depths from 48 to 87 m.

Bodotria nitida sp. nov.

Figs 37–38

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
WCD	33°S 17°E	11–26 m	12	3	3	16		14	48	5
LBT	32°S 18°E	3–15 m	3	6	3	7	10	2	31	15
FAL & FBY	34°S 18°E	2–11 m	5	17	1	84	8	23	138	12
SST	34°S 21°E	15 m		1					1	1
SAM	33°S 18°E	?	2			2		1	5	1*
SCD	33°S 25°E	7 m	5	2	4		1	3	15	1

*from stomach of *Rhabdosargus globiceps*

Holotype

Ovigerous female, in the South African Museum, SAM–A15483, collected during the UCT benthic survey, 24 April 1962. Type locality: 11 m, outside Saldanha Bay (33°07′S 17°58′E). UCT station number WCD 129M.

Description

Ovigerous female, *holotype*, length 6,7 mm. Large, rotund. Integument yellowish-white in alcohol, lustrous at low magnifications, reticulate with faint pits at high magnifications. Carapace (Fig. 37A) smooth, no trace of carinae; nearly twice as long as deep. Antennal notch (Fig. 37B) deeply excavate, anterolateral angle acutely pointed and protruding beyond tip of pseudorostral lobes. Eyelobe (Fig. 37C) rounded, eyeless, protruding beyond anterior tip of pseudorostral lobes.

Articulatory peg present between carapace and second pedigerous somite dorsolaterally. This somite wide, smooth, very slightly elevated above level of carapace; third to fifth slightly elevated dorsally, with well-defined sideplates. Middorsal carina present on thorax. Carapace slightly longer than free thoracic somites. Cephalothorax and abdomen subequal in length. Abdominal somites with sideplates defined ventrally, each overlapping succeeding one.

Antenna 1 (Fig. 37D) of moderate length, first segment subequal in length to next two together. Flagellum short, 2-segmented, with two aesthetascs. Accessory flagellum minute, 1-segmented.

Maxilliped 3 (Fig. 37E) elongate, basis more than twice length of remaining segments together; distal prolongation short, reaching articulation of ischium and merus. Merus slightly expanded, carpus hardly at all.

Basis of pereiopod 1 (Fig. 37F) curved, wider at base, nearly twice length of rest of limb. Ischium short, merus and carpus subequal in length, dactyl short.

Pereiopod 2 (Fig. 37G) stout, 6-segmented. Basis longer than rest of limb, merus stouter than carpus, dactyl poorly armed, twice length of propodus.

Pereiopods 3 (Fig. 37H) to 5 similar, merus and carpus stout, propodus and dactyl narrow.

Telsonic somite (Fig. 37I) rectangular in dorsal view, less than one and a half times as long as broad, very slightly produced between uropods. Peduncle of uropod one and a half times length of telsonic somite, twice length of rami, unarmed. First segment of exopod about a third length of second, unarmed; second with eight plumose setae on inner edge and two short terminal spines. Endopod 2-segmented, first segment four times length of second with three small spines on inner edge; second unarmed except for two small terminal spines.

Adult male, length 6,4 mm, from False Bay. As female, except as follows: carapace (Fig. 38A) more rectangular in lateral view, anterolateral angle obtuse and rounded, antennal notch shallow. Eyelobe (Fig. 38B) shorter, carapace slightly narrower in dorsal view. Abdominal somites stouter.

Antenna 1 (Fig. 38C) shorter, accessory flagellum surrounded by four aesthetascs. Distal prolongation of basis of maxilliped 3 (Fig. 38D) slightly

more produced. Telsonic somite (Fig. 38E) protruding even less between uropods, a little longer than wide. Peduncle relatively longer, armed proximally with six plumose setae and distally with 25–30 serrate setae on inner edge. Second segment of exopod with six plumose setae and first of endopod with eleven fine sharp spines on inner edges.

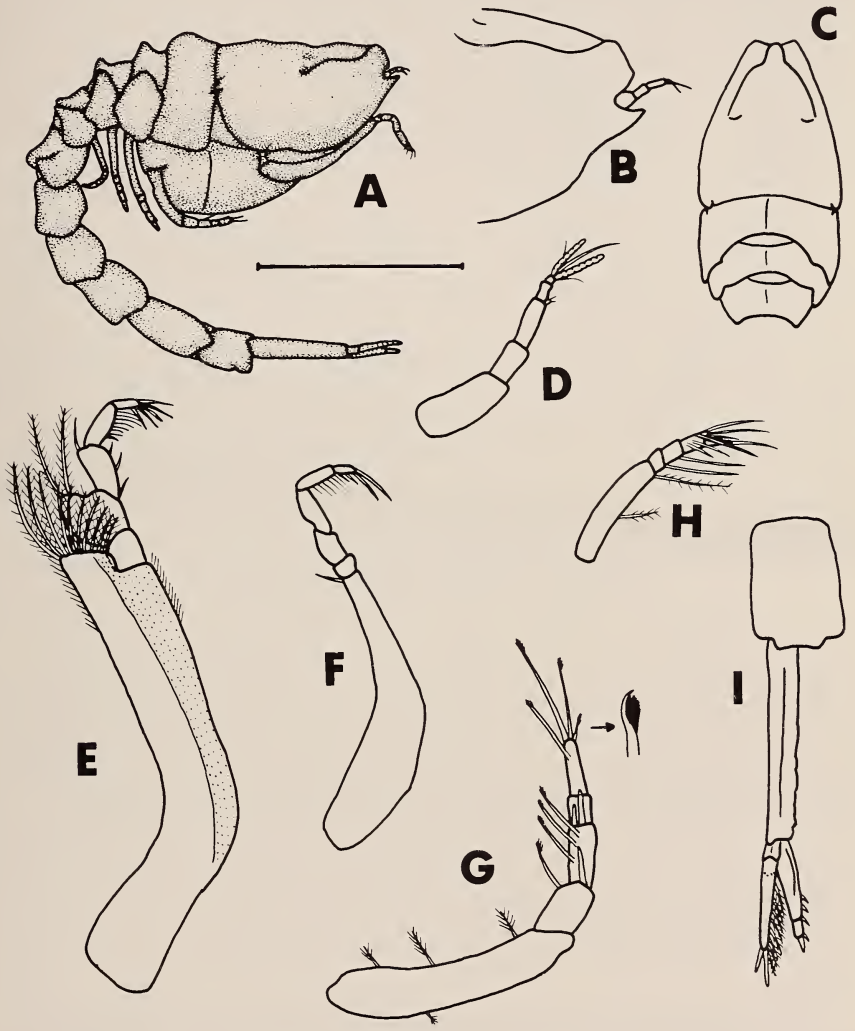

Fig. 37. *Bodotria nitida* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, F, H–I; 0,5 mm for D–E, G.

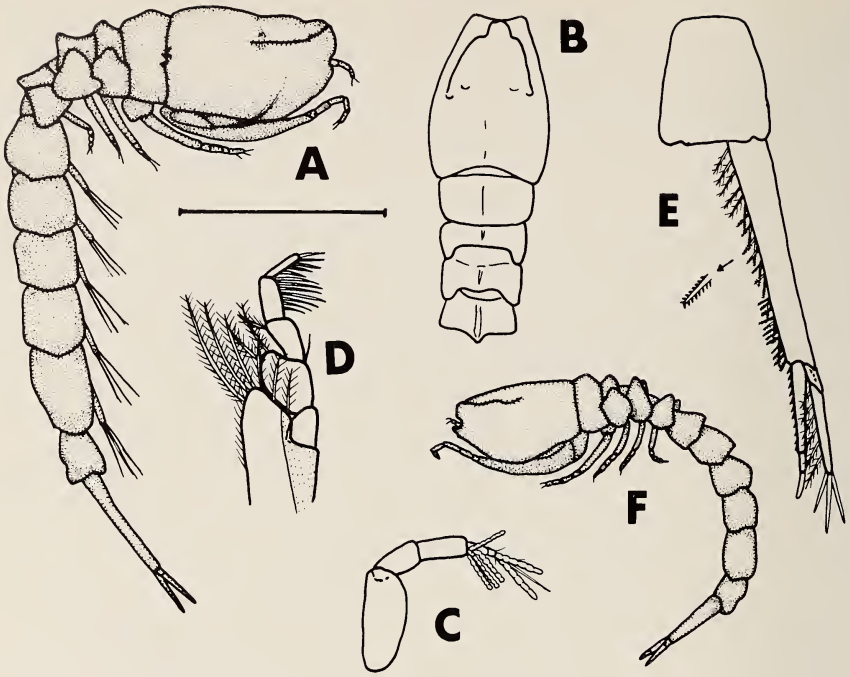

Fig. 38. *Bodotria nitida* sp. nov.
Adult male. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Distal tip of maxilliped 3. E. Telsonic somite and uropod.
Juvenile, paratype. F. Lateral view.
Scale line = 2 mm for A–B, F; 1 mm for E; 0,5 mm for C–D.

Juvenile, paratype (Fig. 38F), length 4,2 mm. Differs from the adults in that the third to fifth pedigerous somites are more elevated dorsally, both in the midline and laterally. The carapace is relatively smaller and smoothly arched dorsally and the peduncle of the uropod is shorter and stouter.

Length

Adult male	5,8–7,2 mm
Ovigerous female	4,5–7,7 mm

Remarks

The only other species of *Bodotria* totally lacking lateral carinae on the carapace are *B. choprai* Kurian, 1951, from India, *B. magna* Zimmer, 1921, from South West Africa and *B. laevigata* LeLoeuff & Intes (in press), from west Africa. Females of the new species may be distinguished from all of these by the very characteristic protrusion of the anterolateral angle beyond the point of the pseudorostral lobes. The male of *B. choprai* has the anterior part of the

carapace deepened and of *B. laevigata* has a 1-segmented endopod of the uropod.

Distribution

Apparently endemic to the Cape, from Saldanha Bay to Port Elizabeth, at depths from 2 to 26 m. Constituting over 5 per cent of the individuals in the collection, this a fairly common species, particularly in False Bay and further north.

Bodotria elevata Jones, 1960

Figs 39–40

Bodotria elevata Jones, 1960: 173–175, fig. 1.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
LBT	33°S 17°E	20 m			1	1	1		3	2
FAL & FBY	34°S 18°E	9–69 m	2	1		4	1		8	7
SST	35°S 22°E	15–50 m	3			2	1		6	4
SCD	34°S 20°E–33°S 27°E	7–87 m	6	3		5	18	1	33	11*

*type locality and some paratypes included.

Previous records

Off Hermanus, south-western Cape (34°S 19°E), 22–37 m, and Lambert's Bay (32°S 18°E), 17 m (Jones 1960).

Holotype

Not specified. Deposited by Jones (1960) in the British Museum (Natural History). Type locality: 22 m, off Hermanus, south-western Cape (34°S 19°E).

Description

Ovigerous female, length 4,1 mm, from the south coast near Mossel Bay. Integument hard, brittle, chalky-white with regularly scattered deep pits. Carapace (Fig. 39A) more than one and a half times as long as deep, middorsal carina only slightly evident. Dorsolateral carina present but not strongly marked. Antennal notch (Fig. 39B) fairly deep, anterolateral angle acute. Articulatory notch present dorsolaterally on posterior border of carapace. Eyelobe (Fig. 39C) eyeless, rounded.

Second pedigerous somite highly elevated, twice as deep as long. Third to fifth pedigerous somites all with sideplates well defined ventrally and dorsally. All free thoracic somites with middorsal carina continuing faintly along abdomen. Carapace slightly longer than free thoracic somites together, cephalothorax longer than abdomen. Abdominal somites rounded, first slightly elevated forming a posteriorly directed point.

Antenna 1 (Fig. 39D) short, first segment longer than next two together. Flagellum 2-segmented with two aesthetascs. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 39E) very long, more than two and a half times length of remaining segments together. Distal prolongation short, reaching half-way along unexpanded part of merus. Merus bluntly expanded, reaching two-thirds length of carpus.

Pereiopod 1 (Fig. 39F) fairly long, basis very stout, broadest at midpoint. Merus and carpus subequal in length, propodus and dactyl short, slender.

Pereiopod 2 (Fig. 39G) stout, 6-segmented. Basis longer than rest of limb. Merus and carpus subequal in length, propodus half length of dactyl. Dactyl armed with a few setae tipped with a brush of filaments.

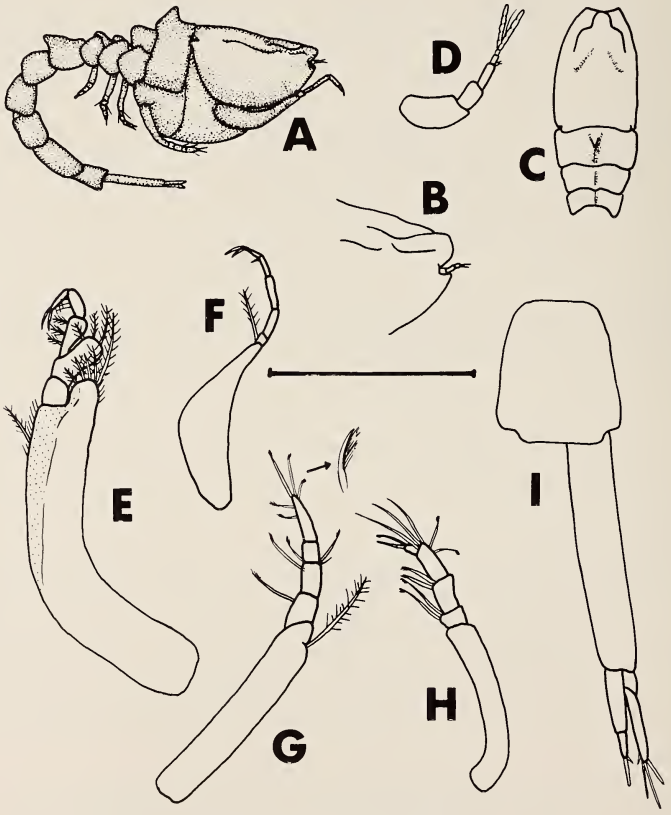

Fig. 39. *Bodotria elevata*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Scale line = 2 mm for A–B; 1 mm for C, F; 0,5 mm for D–E, G–I.

Pereiopods 3 (Fig. 39H) to 5 similar; ischium short and stout; merus and carpus stout, subequal in length. Propodus and dactyl short, slender.

Telsonic somite (Fig. 39I) slightly longer than wide, rectangular in dorsal outline. Peduncle of uropod one and half times length of telsonic somite, two and a half times length of rami, unarmed. Exopod slightly longer than endopod, first segment about a quarter length of second, neither armed except for four terminal spines on second. First segment of endopod twice length of second, unarmed. Second armed with two slender terminal spines.

Adult male, length 4,7 mm, from the south coast near Mossel Bay. As female except as follows: carapace (Fig. 40A) more rectangular in lateral outline, antennal notch and anterolateral angle obscure. Second pedigerous somite only very slightly elevated dorsally. Sideplates of abdominal somites defined ventrally.

Antenna 1 (Fig. 40B) with three aesthetascs arising between flagella. Prolongation of basis and merus of maxilliped 3 (Fig. 40C) slightly longer. Basis of pereiopod 1 narrower with two spines half-way along length, carpus narrowed proximally. Pereiopod 2 narrower and shorter. Propodus of pereiopods 3 to 5 longer. Uropod (Fig. 40D) strongly armed: peduncle with eight plumose setae proximally and twenty-eight serrate spines distally in two rows on inner edge. Second segment with five plumose setae on inner edge, one spine and two plumose setae terminally. First segment of endopod with eight spines on inner edge, second with two on inner edge and one terminally.

Juvenile (Fig. 40E), length 2,4 mm, from type locality. Second pedigerous somite very strongly elevated to a sharp point dorsally, first abdominal somite elevated to two points dorsolaterally. Juveniles may be confused with juveniles

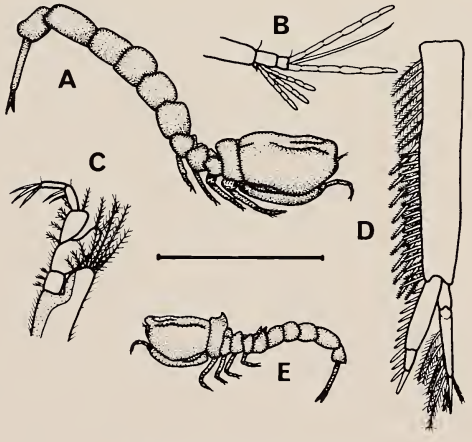

Fig. 40. *Bodotria elevata*

Adult male. A. Lateral view. B. Distal tip of antenna 1. C. Distal tip of maxilliped 3. D. Uropod. Juvenile. E. Lateral view.

Scale line = 2 mm for A, E; 0,5 mm for C–D; 0,2 mm for B.

of *B. magna* which also have the elevated second pedigerous somite, but there is always some degree of sculpturing in the latter, whereas in *B. elevata* the integument is always smooth. Also, in *B. magna* the first abdominal somite is elevated to a single point middorsally.

Length

Adult male	4,7–5,0 mm
Ovigerous female	3,8–4,3 mm

Remarks

The author has examined Jones's paratypes which, apart from being poorly calcified, are very much the same as those in the present collection. There are a number of differences between individuals from the west coast and those (frequently more calcified) from the south coast. Those from False Bay are intermediate in most respects. In both male and female it is extremely difficult to detect the second lateral carina in Jones's specimens and in the newer material these seem to be entirely absent; the lateral carinae do not extend on to the second pedigerous somite and there appear to be no lenses in the eye. Neither the peduncle nor the rami of the female uropod is serrated, but the armature of the male uropod is identical with that described by Jones. These variable characters are in accordance with the thesis that the species of *Bodotria* are more variable than those of most genera in the Bodotriidae.

B. elevata is the only species in the genus in which the second pedigerous somite alone is elevated in the adult female. The male is less readily identifiable but the distal segments of maxilliped 3 are characteristic.

Distribution

Apparently endemic to the west and south coasts of the Cape, occurring in small numbers from Lambert's Bay to East London at depths from 7 to 87 m.

Bodotria montagui Stebbing, 1912.

Fig. 41

Bodotria montagui Stebbing, 1912: 141–142, pl. 51(A).

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
SWD	26°S 15°E	26 m		2	2		3		7	1
LBT	32°S 18°E	20–33 m	2			1	1		4	4
SB	33°S 17°E	31 m				1			1	1
FAL & FBY	34°S 18°E	29–87 m		1	1	2	3	1	8	6
SST	34°S 21°E	15 m				1			1	1
SCD	33°S 27°E	88 m					1		1	1

Previous records

Off East London (32°S 28°E), 75 m.

Holotype

Female deposited by Stebbing (1912) in the British Museum (Natural History). Type locality: 75 m, off East London.

Description

Ovigerous female, length 4,8 mm, from the Lambert's Bay transect. Integument solid, brownish in colour, with fine pitting and reticulation at higher magnifications. Carapace (Fig. 41A) less than one and a half times as long as deep, about one and a third times as long as wide, slightly vaulted dorsally. Single lateral carina running along entire length of carapace except at extreme anterior tip, almost straight. Anterolateral angle acute, rounded; antennal notch rounded, moderately excavate. Pseudorostral lobes meeting for short distance in front of rounded, eyeless eyelobe (Fig. 41B). Sides of carapace slightly oval in dorsal view. Middorsal carina present but not strongly defined on carapace and free pedigerous somites.

Second pedigerous somite with strong lateral carina continuing from that on carapace, moderately wide, not elevated dorsally; third to fifth with sideplates rounded, keeled dorsolaterally and slightly produced middorsally. Carapace slightly longer than free thoracic somites together, cephalothorax slightly longer than abdomen. Abdominal somites rounded ventrolaterally.

First segment of antenna 1 (Fig. 41C) wide, subequal in length to remaining segments together. Next two segments subequal in length. Flagellum 2-segmented with two aesthetascs. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 41D) more than twice length of remaining segments together, distal prolongation fairly long and relatively narrow, reaching beyond articulation of merus and carpus. Ischium longer than wide, longer than merus. Merus slightly expanded distally, carpus widened. Propodus and dactyl cylindrical.

Basis of pereiopod 1 (Fig. 41E) stout proximally, longer than remaining segments together. Ischium very small, carpus longer than ischium and merus or propodus and dactyl together. Propodus slightly expanded distally.

Pereiopod 2 (Fig. 41F) fairly short, basis subequal in length to rest of limb. Merus longest of distal segments, dactyl small and poorly armed.

Pereiopods 3 (Fig. 41G) to 5 similar, pereiopod 5 very short and slender. Basis of pereiopod 3 subequal in length to rest of limb, merus and carpus stout, carpus slightly longer.

Telsonic somite (Fig. 41H) little longer than wide, produced slightly between uropods. Peduncle of uropod one and a half times length of telsonic somite, nearly twice length of rami, unarmed. First segment of exopod less than half length of second, unarmed. Second segment serrated on inner edge with three spines terminally. First segment of endopod more than three times length of second with inner edge serrated proximally and with four spines distally. Second segment armed only with two terminal spines.

Adult male, length 5,8 mm, from the Lambert's Bay transect. As female

except as follows: integument lighter. Carapace (Fig. 41I) slightly longer, second pedigerous somite narrower. Abdominal somites larger, sideplates defined ventrally.

Basal segment of antenna 1 longer, accessory flagellum surrounded by five aesthetascs. Distal portion of maxilliped 3 (Fig. 41J) much more slender, particularly prolongation of basis. Basis of pereiopod 1 with seven spines near

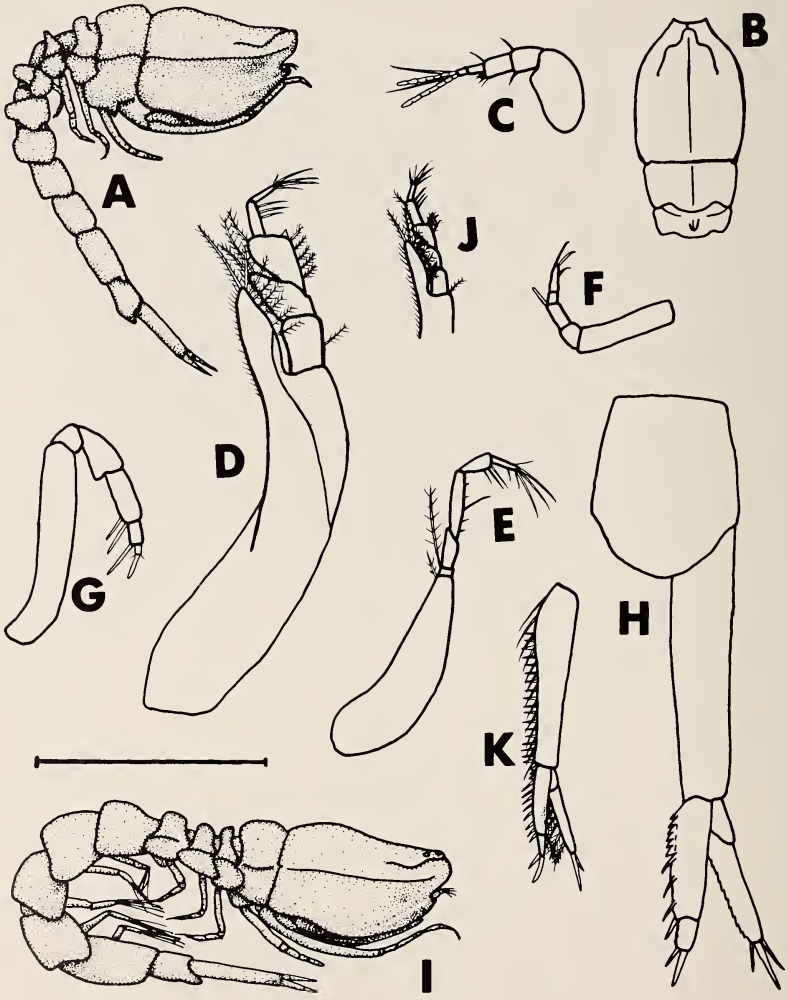

Fig. 41. *Bodotria montagui*

Ovigerous female. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod.
Adult male. I. Lateral view. J. Distal tip of maxilliped 3. K. Uropod.

Scale line = 2 mm for A–B, I; 1 mm for E–F, J–K; 0,5 mm for C–D, G–H.

mid-region, propodus not expanded. Merus of pereiopod 2 slightly longer. Carpus of pereiopods 3 to 5 shorter and propodus stouter. Peduncle of uropod (Fig. 41K) armed with about thirty-one fine, sharp spines on two rows on inner edge. Second segment of exopod with six plumose setae on inner edge. First segment of endopod with three short and eight long fine spines on inner edge.

Length

Adult male	5,8 mm
Ovigerous female	3,8–5,0 mm

Remarks

Despite the rather indefinite nature of Stebbing's diagrams of *B. montagui*, it seems fairly certain that the present specimens can be referred to his species. The main differences between the two are: Stebbing figures the propodus of maxilliped 3 of his unique female as being expanded; the propodus of pereiopod 1 is longer and not expanded; the telsonic somite is shorter; the second segment of the exopod of the uropod has a few plumose setae on the inner edge. On the other hand, the very great similarity in the rest of the uropod and maxilliped 3 suggests that these are indeed referable to the same species. The rather extraordinary placing of the lateral carina very far ventrally on the carapace and second pedigerous somite in Stebbing's drawing should perhaps be discounted, since if this is an accurate representation, then the individual would indeed be unique in the genus.

The species is closest to *B. intermedia* LeLoeuff & Intes (in press), from which it may be distinguished by the longer and more vaulted carapace, the shorter ischium and merus of maxilliped 3, the more dorsally situated lateral carina on the carapace and second pedigerous somite and the slightly longer basis of pereiopod 1 in *B. intermedia*.

Distribution

Apparently endemic to the coasts of South and South West Africa, being found occasionally between Lüderitz and East London at depths from 15 to 88 m, more commonly in the west.

Bodotria tenuis sp. nov.

Fig. 42

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
SST	34°S 21°E–35°S 22°E	80–200 m	2			3	11	4	20	4
SCD	34°S 20°E–33°S 27°E	78–200 m		28	2	1	17	1	49	7
SAM	29°S 32°E	550 m			1		2		3	1

Holotype

Ovigerous female, in the South African Museum, SAM–A15485, collected during the UCT benthic survey, 20 June 1972. Type locality: 200 m, off Still Bay (35°22′S 22°31′E). UCT station number SST 17K.

Description

Ovigerous female, *holotype*, length 5,2 mm. Integument dull white, reticulations not very evident even at high magnifications. Body slender, elongate. Carapace (Fig. 42A) more than twice as long as deep with strong dorsolateral carina, almost rectangular in cross-section, sides more or less vertical. Major carina running full length of carapace, second minor carina (almost absent in some) midlateral, forming lower edge of lateral depression, running from below anterolateral angle to posterior third of carapace, slightly curved. Anterolateral angle acute, rounded. Antennal notch fairly deeply excavate and small. Eyelobe (Fig. 42B) eyeless, rounded, pseudorostral lobes meeting for a very short distance in front of it. Carapace about a quarter again as long as wide. Middorsal carina present (but not strongly marked) on carapace and thorax only. A single pair of very characteristic black pigmented areas present at level of upper carina very slightly anterior to midpoint of carapace.

Carapace slightly longer than free thoracic somites together, abdomen longer than cephalothorax by one somite. Second pedigerous somite wide, not elevated, dorsolateral carina strongly defined. Third to fifth pedigerous somites low, all with well-defined sideplates formed by posterior continuation of lateral carina. First two abdominal somites also with lateral carina, rest cylindrical.

Antenna 1 (Fig. 42C) fairly small, first segment subequal in length to remaining segments together, fairly slender. Flagellum 2-segmented with two aesthetascs. Accessory flagellum minute, 1-segmented.

Basis of maxilliped 3 (Fig. 42D) more than twice length of remaining segments together, fairly stout; distal prolongation relatively pointed, slender, reaching articulation of merus and carpus. Ischium longer than wide. Merus slightly expanded, reaching half length of carpus. Carpus slightly expanded, propodus and dactyl cylindrical.

Basis of pereiopod 1 (Fig. 42E) stouter proximally, slightly longer than rest of limb. Ischium very short, carpus slightly expanded, longer than ischium and merus together and shorter than subequal propodus and dactyl together.

Pereiopod 2 (Fig. 42F) stout, basis slightly longer than rest of limb. Merus and carpus stout, subequal in length; propodus more than half length of dactyl.

Pereiopods 3 (Fig. 42G) to 5 similar, slender. Each segment distal to basis narrower than the preceding one.

Telsonic somite slightly produced between uropods. Peduncle of uropod (Fig. 42H) stout, twice length of endopod, unarmed but finely serrate on inner edge. Exopod slightly longer than endopod, first segment third length of second, unarmed; second segment armed with six slender plumose setae on inner edge and three fine spines terminally. First segment of endopod more than three

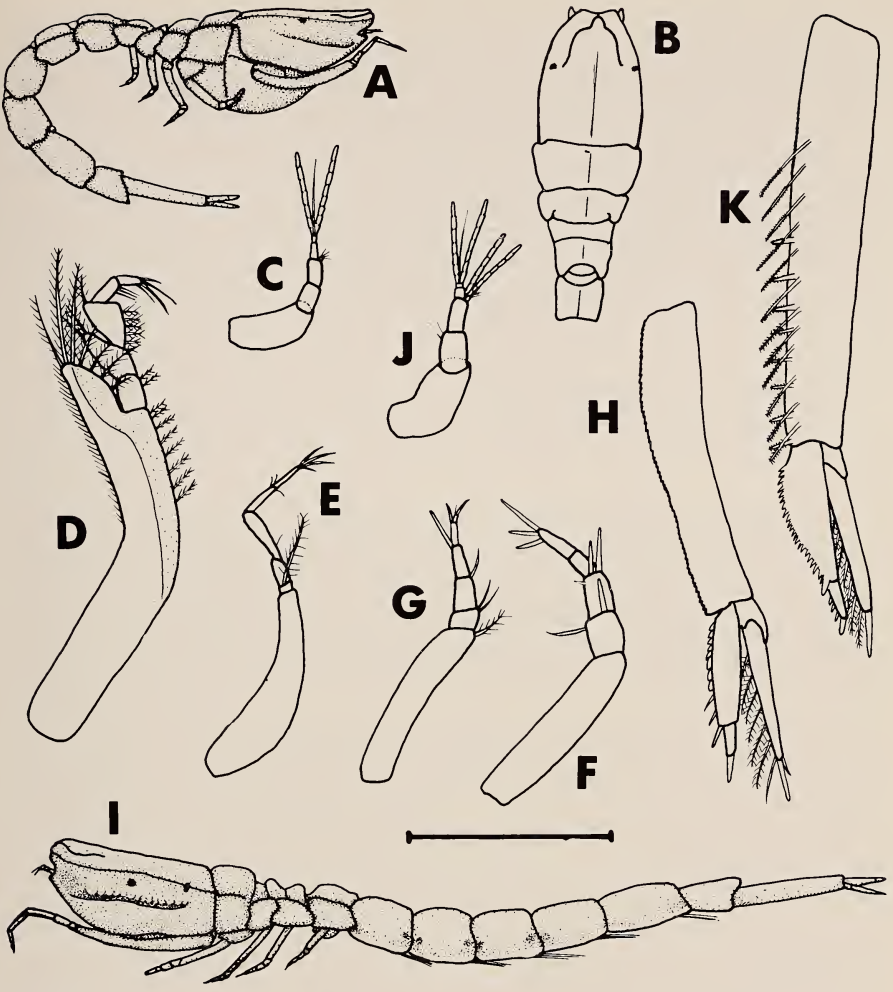

Fig. 42. *Bodotria tenuis* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1 D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Uropod. Adult male, paratype. I. Lateral view. J. Antenna 1. K. Uropod.

Scale line = 2 mm for A–B, I; 1 mm for E; 0,5 mm for C–D, F–H, J–K.

times length of second, scalloped proximally on inner edge and with three small spines distally; second segment with a single terminal spine.

Adult male, paratype, length 6,5 mm. As female except as follows: dorsolateral carina of carapace (Fig. 42I) slightly more laterally situated, ventrolateral carina better defined, upper edge scalloped. Two pairs of pigmented areas on carapace. Anterolateral angle obtuse, antennal notch very shallow.

No lateral carinae on abdomen; sideplates defined ventrally.

Basis of antenna 1 (Fig. 42J) stouter and shorter with two aesthetascs. Basis of maxilliped 3 narrower, distal prolongation reaching half-way along carpus, carpus slightly longer. Basis of pereiopod 1 straight. Merus, carpus and propodus of pereiopods 3 to 5 longer and narrower. Peduncle of uropod (Fig. 42K) stouter, nearly two and a half times length of endopod, armed with twenty serrate setae in two rows on inner edge. Second segment of exopod with seven plumose setae on inner edge and a single terminal spine. First segment of endopod wide, strongly serrate on inner edge, serrations almost forming a row of small setae; second segment with three very small spines on inner edge.

Length

Adult male	6,5–6,7 mm
Ovigerous female	4,8–6,0 mm

Remarks

The most remarkable feature of this species is its relatively great depth range. No members of *Bodotria* have previously been found at depths greater than 120 m, yet the deepest at which *B. tenuis* is known to occur is 550 m

The specimens from the deep stations in the southern Mozambique Channel differ slightly from those further south in that there are no pigmented spots on the carapace and the lower carina is very faint. The second pedigerous somite is not carinate at all.

The species closest to *B. tenuis* may be distinguished from it as follows: *B. intermedia* Le Loeuff & Intes (in press) has no lower lateral carina on the carapace and the basis of pereiopod 1 is longer. The carapace in both *B. africana* Zimmer, 1921 and *B. armoricana* Le Loeuff & Intes (in press) is less than twice as long as deep; in *B. armoricana* the bases of maxilliped 3 and pereiopod 1 are longer and in *B. africana* they are shorter.

Distribution

From the Cape Peninsula to the southern Mozambique Channel at depths from 78 to 550 m; one of the more common species at these depths.

Bodotria falsinus sp. nov.

Fig. 43

Records

			adult ♂	sub-adult ♂	ovig. ♀	other	total	no. of records
FAL & FBY	34°S 18°E	40–69	2	1	2	2	7	5
SST	35°S 22°E	50–80	4	13	10	7	34	4
SCD	33°S 25°E	32	1				1	1

Holotype

Ovigerous female, in the South African Museum, SAM–A15482, collected during the UCT benthic survey, 20 June 1972. Type locality: 80 m, off Still Bay (34°40′S 21°39′E). UCT station number SST 29X.

Description

Ovigerous female, holotype, length 3,1 mm. Integument clear white, slightly reticulate, with a number of small pits on carapace. Carapace (Fig. 43A) very flat, almost twice as long as deep, slightly wider than long. Middorsal carina poorly defined; lateral carina dorsal to midlateral line, very evident, making carapace wider dorsally than ventrally in cross-section. A second much more evanescent carina present below major one, formed by lower edges of a series of small pits in a row, evident anteriorly only, beginning immediately behind eyelobe. Anterolateral angle (Fig. 43B) acute, antennal notch deep and narrow. Pseudorostral lobes short, not meeting in front of narrow, eyeless eyelobe (Fig. 43C).

Second pedigerous somite almost as wide as long, with midlateral carina continuing from carapace; ventrolaterally with rounded, yellowish protuberance. Third and fourth pedigerous somites with sideplates defined, not elevated dorsally; fifth slightly elevated in middorsal line. Middorsal carina present on thorax, absent from abdomen. Carapace longer than free thoracic somites together, abdomen equal in length to carapace and first two free thoracic somities together.

Antenna 1 (Fig. 43D) small, first segment rectangular in outline, nearly twice length of remaining segments together. Flagellum 1-segmented with two aesthetascs. Accessory flagellum minute, 1-segmented.

Maxilliped 3 (Fig. 43E) stout, basis curved, about twice length of rest of limb. Distal prolongation short, rounded, reaching half-way along merus. Ischium longer than wide, merus slightly expanded, carpus very wide distally.

Basis of pereiopod 1 (Fig. 43F) slightly longer than rest of limb, curved. Ischium short, wider than long; merus stout, carpus very stout, hardly more than twice as long as broad, with eight spines on lower edge, longer than subequal propodus and dactyl together.

Pereiopod 2 (Fig. 43G) stout, basis more than one and a half times length of remaining segments together. Suture-line of basis and ischium faintly visible on one side, marked by a single plumose seta. Merus longer and stouter than carpus; dactyl and propodus both short and stout, dactyl about twice length of propodus.

Pereiopods 3 (Fig. 43H) to 5 similar, carpus of each longest of distal segments. Pereiopod 5 by far the shortest.

Telsonic somite (Fig. 43I) longer than wide, produced between uropods for a short distance. Peduncle of uropod little longer than telsonic somite, one and a half times length of endopod, with six small, fine spines each on inner and outer edges. Exopod slightly shorter than endopod, first segment a third

length of second, unarmed; second armed with six plumose setae on inner edge and two spines terminally. First segment of endopod four times length of second, armed only with two small spines distally on outer edge; second armed with two spines terminally.

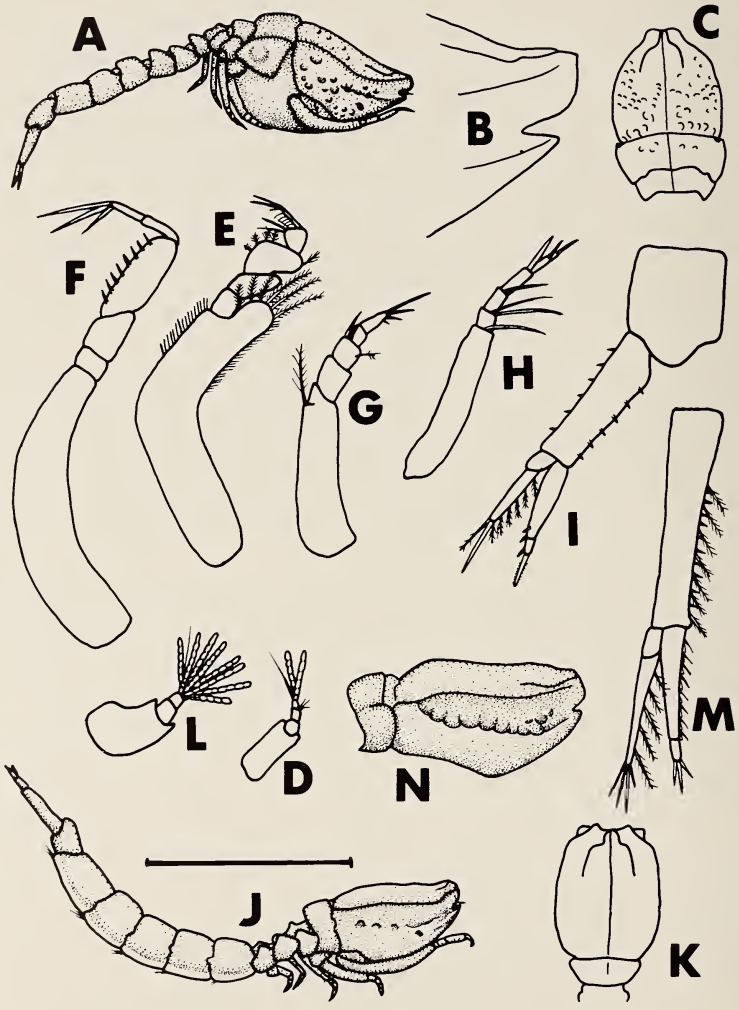

Fig. 43. *Bodotria falsinus* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Pereiopod 1. G. Pereiopod 2. H. Pereiopod 3. I. Telsonic somite and uropod.

Adult male, paratype (large). J. Lateral view. K. Dorsal view of carapace. L. Antenna 1. M. Uropod.

Adult male, paratype (small). N. Lateral view of carapace.

Scale line = 2 mm for A, C, J–K; 1 mm for I, M–N; 0,5 mm for B, D–H, L.

Note: although the appendages of all female specimens referred to this species are very similar, the gross appearance of animals, even from the same sample, varies quite considerably. In ovigerous females the sides of the carapace may be pitted or quite smooth; the lower carina may be fairly evident, evanescent (Fig. 43A) or absent; the sharpness of the lateral carina is variable; the second pedigerous somite may or may not be carinate laterally and may or may not possess a rounded protuberance. The size of individuals varies between 2,4 and 4,1 mm. These variable characters are not always found together in the same individuals, suggesting that they are genetic variations.

Adult male, paratype, length 4,2 mm. As female, except as follows: carapace (Fig. 43J) almost rectangular in lateral outline, fewer pits present. Antennal notch not as deep. Eyelobe (Fig. 43K) wider, carapace longer than wide. Abdominal somites larger, sideplates defined ventrally.

First segment of antenna 1 (Fig. 43L) larger, accessory flagellum surrounded by six aesthetascs. Basis of maxilliped 3 less curved; ischium and prolongation of basis longer. Median edge of basis of pereiopod 1 with four spines. Merus and carpus of pereiopods 3 to 5 stouter. Telsonic somite slightly more produced between uropods. Peduncle of uropod (Fig. 43M) with seven plumose setae and ten small sharp spines on inner edge. Second segment of exopod terminating in four spines. First segment of endopod serrated, serrations alternating with eight small spines; second segment terminating in three spines.

Note: as in the female, there are a number of variable characters in the males. The secondary carina of the carapace may be well (Fig. 43N) or poorly (Fig. 43J) defined; the lateral carina may be present or absent from the second pedigerous somite; the integument may be strongly or slightly pitted. The size varies considerably.

Length

Adult male	2,9–4,6 mm
Ovigerous female	2,4–4,1 mm

Remarks

B. falsinus is similar to *B. vertebrata* sp. nov., *B. lata* Jones, 1955 and *B. australis* Stebbing, 1912. It may be distinguished from *B. vertebrata* by the absence of elevated points on the pedigerous and abdominal somites and by its much wider carapace, and from *B. lata* and *B. australis* also by its wider carapace, deeper antennal notch and enlarged carpus of pereiopod 1.

Distribution

Apparently endemic to the south coast of South Africa from False Bay to Port Elizabeth at depths from 32 to 80 m; not a commonly encountered species.

Bodotria vertebrata vertebrata sp. et subsp. nov.

Fig. 44

Records

			adult ♂	sub-adult ♂	ovig. ♀	♂ & ♀	total	no. of records
FAL & FBY	34°S 18°E	11–31 m	13	1	11	6	31	15
SST	34°S 21°E	15 m	1		3		4	1
SCD	34°S 23°E	11–42 m	2	1	2	2	7	3

Holotype

Ovigerous female, in the South African Museum, SAM–A15487, collected during the UCT benthic survey, 13 July 1967. Type locality: 23 m, False Bay (34°08′S 18°30′E). UCT station number FBY 90V.

Description

Ovigerous female, holotype, length 3,1 mm. Integument white, crystalline; no reticulations visible even at high magnifications. Carapace (Fig. 44A) smooth, less than twice as long as deep. Single distinct lateral carina running from posterior edge to level of anterolateral angle, with a few small, rounded pits in a single row beneath. Carapace rounded in cross-section, no middorsal carina, lateral carina not very sharp. Anterolateral angle acute, rounded; antennal notch narrow, moderately excavate. Pseudorostral lobes meeting for a short distance in front of rounded, eyeless eyelobe (Fig. 44B). Carapace less than one and a half times as long as wide.

Second pedigerous somite very wide, lacking lateral carina; third produced dorsally and laterally to form three rounded spines; fourth and fifth somites elevated to points middorsally only, sideplates defined dorsolaterally. First two abdominal somites produced to a wider elevated band dorsally. Carapace and free thoracic somites subequal in length, cephalothorax longer than abdomen by two segments.

Antenna 1 (Fig. 44C) very small, basis longer than remaining segments together. Flagellum with two aesthetascs, accessory flagellum minute.

Basis of maxilliped 3 (Fig. 44D) strongly curved, less than one and a half times length of remaining segments together; distal prolongation short, rounded, reaching proximal third of merus. Ischium relatively long and narrow, merus wide but very slightly expanded distally; carpus wider than long.

Basis of pereiopod 1 (Fig. 44E) very stout, slightly longer than remaining segments together, slightly curved. Ischium very short, much wider than long. Merus stout, carpus very stout, longer than subequal propodus and dactyl together.

Pereiopod 2 short and stout (Fig. 44F). Basis longer than rest of limb; junction of ischium and basis evident, marked by a single plumose seta. Merus

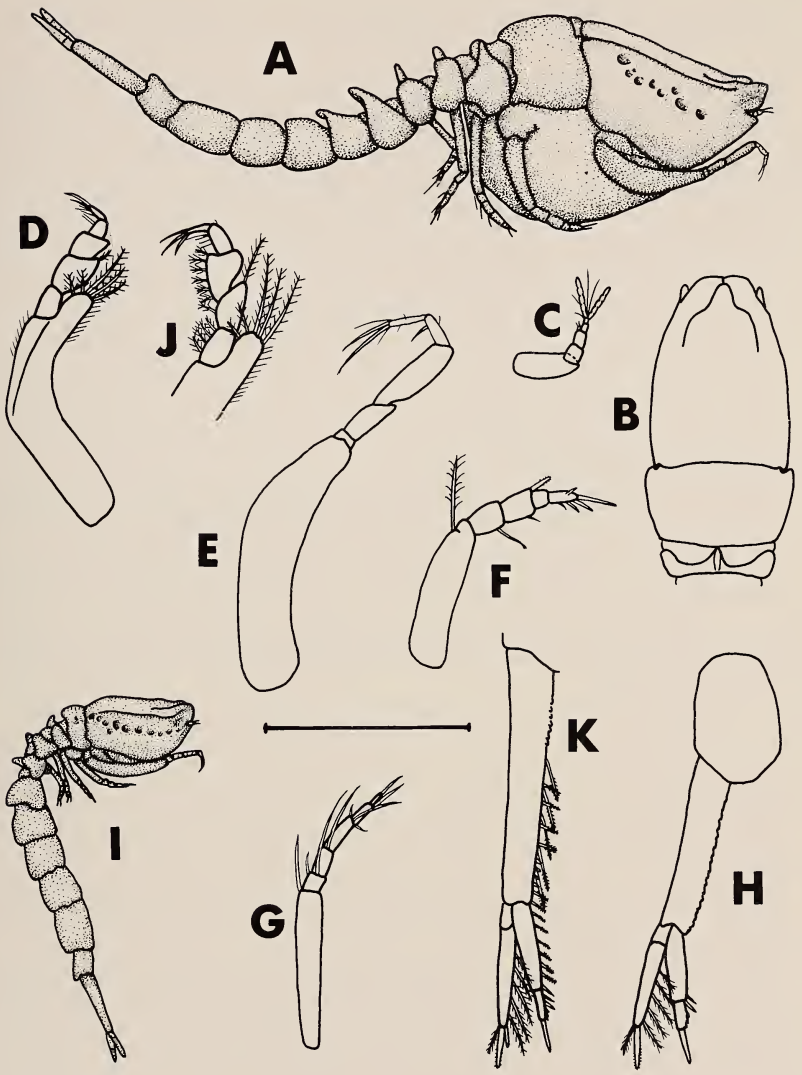

Fig. 44. *Bodotria vertebrata vertebrata* sp. et subsp. nov.

Ovigerous female, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod.

Adult male, paratype. I. Lateral view. J. Distal tip of maxilliped 3. K. Uropod.

Scale line = 2 mm for I; 1 mm for A–B, D–G; 0,5 mm for C, H, J–K.

and carpus wide and stout, propodus short, more than half length of narrow dactyl.

Pereiopods 3 (Fig. 44G) to 5 similar, slender; pereiopod 5 much shorter than 4.

Telsonic somite (Fig. 44H) more than one and a half times as long as wide, rounded posteriorly, slightly produced between uropods. Peduncle of uropod one and a third times length of telsonic somite, more than one and a half times length of rami, unarmed, but serrated on inner edge. First segment of endopod two and a half times length of second, armed only with two spines distally; second slightly serrated on inner edge with a single spine terminally. First segment of exopod more than three times length of second; second with five plumose setae on inner edge and two terminally.

Adult male, paratype, length 3,5 mm. As female, except as follows: carapace (Fig. 44I) more rectangular in lateral outline, carina situated less dorsally, a few more pits below. Antennal notch shallower. Pedigerous somites narrower, less elevated dorsally, abdominal somites not at all. Abdominal somites bigger, sideplates defined ventrally.

Antenna 1 shorter, accessory flagellum surrounded by five aesthetascs. Ischium, merus and carpus of maxilliped 3 (Fig. 44J) longer, carpus wider. Basis of pereiopod 1 longer. Pereiopods 3 to 5 shorter. Peduncle of uropod (Fig. 44K) slightly more than twice length of rami, armed with nine long serrate spines proximally and six very short ones distally on inner edge. First segment of endopod with seven serrate setae on inner edge, second with two short and three very short spines.

Length

Adult male	3,1–3,8 mm
Ovigerous female	2,9–4,1 mm

Remarks

The presence of elevated spines middorsally on thoracic and abdominal somites is unique in the genus.

There are two distinct forms of the species: those from the south coast and False Bay have the lateral carina continuous along almost the whole length of the carapace and a number of small rounded pits below: those from the west coast have the carina extending only along half of the carapace without pits below. The forms are so similar that it seems unnecessary to split them into two species, but the differences are consistent enough to require subspecific differentiation. The differences between *B. vertebrata vertebrata* and *B. vertebrata semicarinata* are described in the discussion of the latter below.

Distribution

Found occasionally from False Bay to Knysna at depths from 11 to 42 m; less common than *B. v. semicarinata*.

Bodotria vertebrata semicarinata sp. et subsp. nov.

Fig. 45

Records

			adult ♂	sub-adult ♂	ovig. ♀	♀	juv.	total	no. of records
WCD	33°S 17°E–34°S 18°E	11–32 m	8	6	16	5	11	36	7
LBT	32°S 18°E	20–33 m	1		1			2	2
SB	33°S 17°E	7–29 m	6	10	13	11		40	11
SAM	33°S 18°E	?	2		3			5	1*

*from stomach of *Rhabdosargus globiceps*.

Holotype

Ovigerous female, in the South African Museum, SAM–A15486, collected during the UCT benthic survey, 25 April 1962. Type locality: 26 m, off Saldanha Bay (33°07′S 17°57′E). UCT station number WCD 134X.

Description

This subspecies is identical in most respects with *B. v. vertebrata*, differing from it as follows:

Ovigerous female, *holotype*, length 3,4 mm. Integument browner, velvety, finely reticulate. Carapace (Fig 45A) deeper, about one and a half times as long as deep, hardly longer than wide. Lateral carina extending no more than half length of carapace, lacking pits below. Pseudorostral lobes deeper and shorter, not meeting in front of eyelobe. Second pedigerous somite deeper, with mid-dorsal carina; third less elevated dorsally. Abdomen shorter, subequal in length to cephalothorax. Basis of antenna 1 slightly wider. Bases of maxilliped 3 and pereiopod 1 longer, of pereiopod 1 (Fig. 45B) nearly twice length of rest of limb. Pereiopod 2 (Fig. 45C) longer and more slender. Peduncle of uropod (Fig. 45D) twice length of rami, not serrate.

Adult male, *paratype*, length 3,8 mm. The same differences occur in the external anatomy of the males (Fig. 45E), apart from which the peduncle of the uropod (Fig. 45F) is about one and three-quarters times the length of the rami with sixteen long, slender spines evenly spaced along inner edge. The first segment of the exopod is slightly longer relative to the second.

Length

Adult male	3,6–4,1 mm
Ovigerous female	2,9–4,3 mm

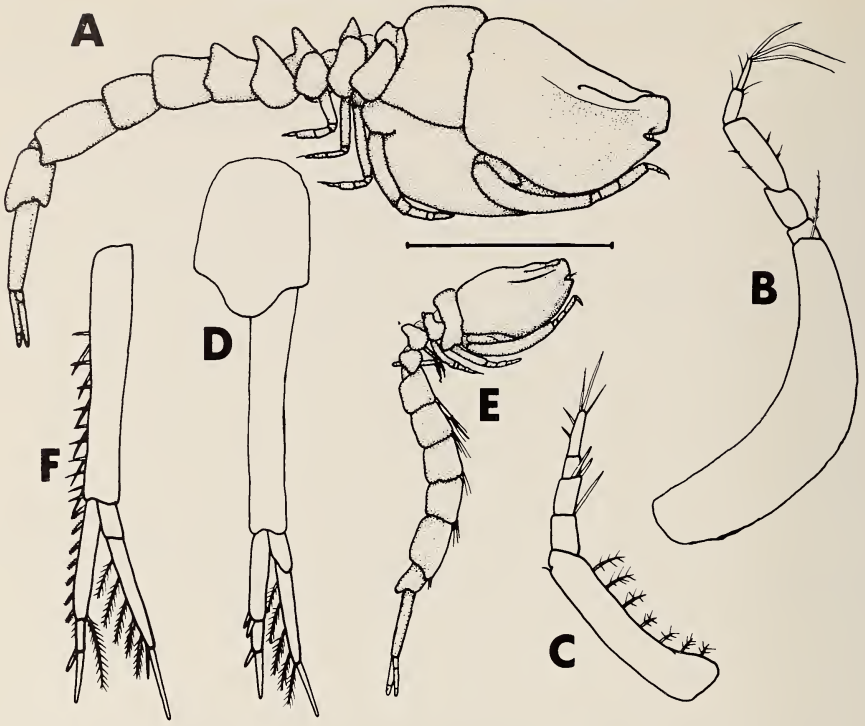

Fig. 45. *Bodotria vertebrata semicarinata* sp. et subsp. nov.
Ovigerous female, holotype. A. Lateral view. B. Pereiopod 1. C. Pereiopod 2. D. Telsonic somite and uropod.
Adult male, paratype. E. Lateral view. F. Uropod.
Scale line = 2 mm for E; 1 mm for A; 0,5 mm for B–D, F.

Remarks

In the genus *Bodotria* in most cases it is difficult to determine the limits of species because there are such great individual differences that there is a danger of creating more species than is perhaps realistic. For this reason the number of species proliferates greatly in almost every area where members of the genus are to be found. *B. vertebrata* is one of the few species in which the differences between individuals are consistent in two contiguous geographical areas, and for this reason subspecific separation is possible. The two forms are clearly very similar to each other and do not warrant specific differentiation.

Distribution

Apparently endemic to the west coast of South Africa from Lambert's Bay to Table Bay at depths from 11 to 33 m. Somewhat more commonly found than *B. v. vertebrata*, this subspecies accounts for nearly 2 per cent of the individuals in the collection.

Bodotria serica sp. nov.

Fig. 46

Records

			adult ♂	sub adult ♂	ovig. ♀	♂ & ♀	juv.	total	no. of records
WCD	34°S 17°E–33°S 18°E	65–79 m			1	1		2	2
FAL & FBY	34°S 18°E	17–87 m	8	4	16	12	7	47	24
SST	35°S 22°E	80 m	15	13	22	3	6	59	2

Holotype

Ovigerous female, in the South African Museum, SAM–A15484, collected during the UCT benthic survey, 21 June 1972. Type locality: 80 m, off Still Bay (34°40′S 21°39′E). UCT station number SST 29W.

Description

Ovigerous female, holotype, length 3,7 mm. Integument silky white, translucent, not strongly calcified, without reticulations. Carapace (Fig. 46A) nearly twice as long as deep, about one and a quarter times as long as wide. Dorsal carina faintly visible on posterior half of carapace and thoracic somites, almost invisible on abdomen. Single pair of rounded lateral carinae present about a third distance from dorsal edge of carapace with slight longitudinal depression below (not present in all specimens). Anterolateral angle acutely pointed, antennal notch evident, fairly deep, rounded. Pseudorostral lobes short, not meeting in front of eyeless eyelobe (Fig. 46B).

Second pedigerous somite very wide, carinate dorsally but not laterally; third deep, moderately wide, not carinate laterally; fourth and fifth very slightly elevated dorsally with sideplates defined dorsally and ventrally. Carapace slightly longer than free thoracic somites together, cephalothorax and abdomen subequal in length. Abdominal somites cylindrical.

Antenna 1 (Fig. 46C) small, first segment subequal in length to remaining segments together. Flagellum 1-segmented with two aesthetascs; accessory flagellum 1-segmented.

Maxilliped 3 (Fig. 46D) fairly long, basis more than twice length of rest of limb. Distal prolongation rounded, hardly reaching articulation of merus and carpus. Merus widely expanded, carpus wider distally than proximally.

Basis of pereiopod 1 (Fig. 46E) slightly longer than rest of limb; carpus longest of remaining segments, propodus and dactyl subequal in length.

Pereiopod 2 (Fig. 46F) stout, basis about one and a half times length of rest of limb; merus and carpus subequal in length, propodus more than half length of dactyl.

Pereiopods 3 (Fig. 46G) to 5 long, bases longer than rest of limbs.

Telsonic somite (Fig. 46H) one and a third times as long as wide, hardly produced between uropods, two-thirds length of peduncle of uropod. Peduncle

unarmed, very slightly less than twice length of rami. First segment of exopod half length of second, second with seven plumose setae on inner edge and a single spine terminally. First segment of endopod more than twice length of second, serrate proximally and with seven sharp spines distally on inner edge;

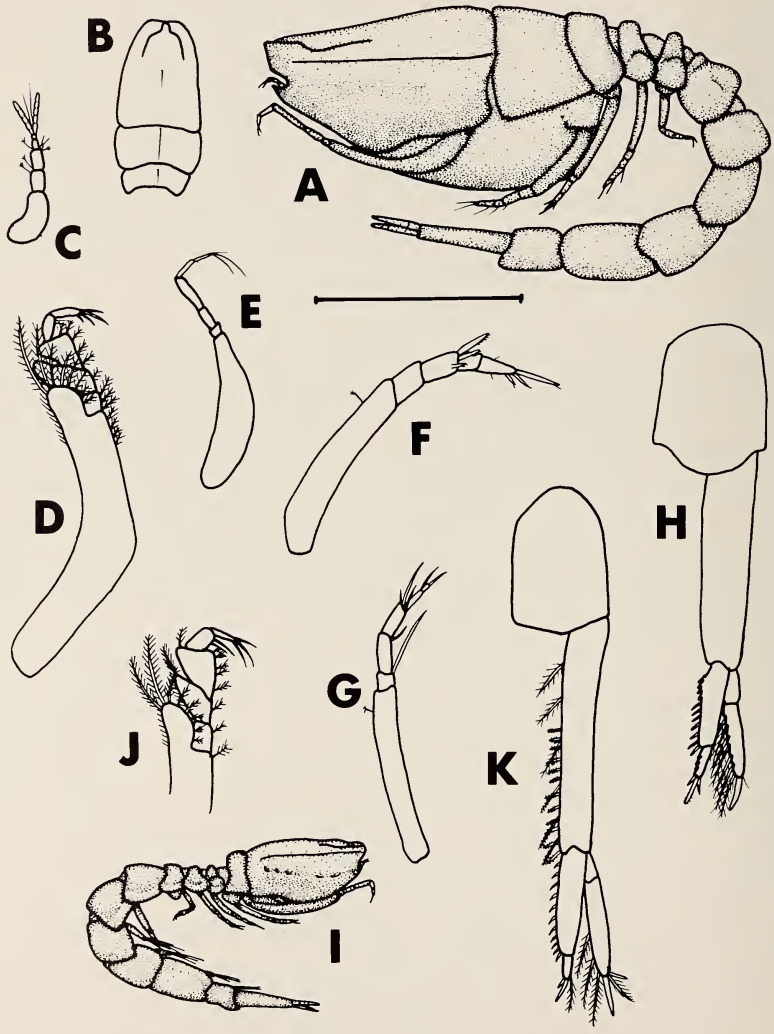

Fig. 46. *Bodotria serica* sp. nov.

Ovigerous female, holotype. A. Lateral view. B. Dorsal view of carapace. C. Antenna 1. D. Maxilliped 3. E. Pereiopod 1. F. Pereiopod 2. G. Pereiopod 3. H. Telsonic somite and uropod.

Adult male, paratype. I. Lateral view. J. Distal tip of maxilliped 3. K. Telsonic somite and uropod.

Scale line = 2 mm for B, I; 1 mm for A, E, H, K; 0,5 mm for C–D, F–G, J.

second with three terminal spines and serrate on inner edge.

Adult male, paratype, length 3,4 mm. As female, except as follows: carapace (Fig. 46I) with several small depressions below lateral carina; anterolateral angle obtuse, antennal notch shallower. Carapace narrower dorsally, with no middorsal carina. Sideplates of abdominal somites defined ventrally. Fifth pedigerous somite produced ventrally to form a rounded protuberance.

Four small aesthetascs between flagella of antenna 1. Merus of maxilliped 3 (Fig. 46J) smaller and carpus larger. Pereiopod 2 smaller than in female. Telsonic somite (Fig. 46K) produced less between uropods. Peduncle of uropod narrower with eighteen setae in two rows on inner edge. Second segment of exopod with three plumose setae, first of endopod with eleven small spines on inner edge.

Length

Adult male	3,3–4,8 mm
Ovigerous female	3,1–4,6 mm

Remarks

This species is most closely allied with *B. tenuis* sp. nov. and *B. australis* Stebbing, 1912, differing from *B. australis* mainly in the lack of a lateral carina on the second and third pedigerous somite in the female or second and fourth in the male, and the longer peduncle of the uropod; and from *B. tenuis* in the lack of the carinae, the rounded prolongation of the basis of maxilliped 3 and the absence of a second lower ridge below the main carina.

In recorded depth range as well as in morphological detail, this species seems to be intermediate between the two named above.

Distribution

Apparently endemic to the south-western coast of South Africa from Saldanha Bay to Still Bay, at depths from 17 to 87 m, this is a fairly common species, especially in the Still Bay region. It accounts for about 2 per cent of the individuals in the collection.

Bodotria australis Stebbing, 1912

Bodotria australis Stebbing, 1912: 142, pl. 51(B).

Remarks

Stebbing described this species from a single female 3,25 mm in length. Although corresponding in many features with several of the new species described here, Stebbing's figures show several characters which, *if* accurately portrayed, are sufficiently distinctive to separate this species from all the others known from South Africa. In particular the lateral carina is present on pedigerous somites 2 to 4 and abdominal somites 2 to 5. A lower lateral carina is present on the carapace, which is more than one and a half times as long as

broad. The distal prolongation of maxilliped 3 is rounded and the carpus of pereiopod 1 is not particularly stout. This combination of characters separates Stebbing's individual from *B. montagui* Stebbing, 1912, *B. falsinus* sp. nov., *B. vertebrata* sp. nov., and *B. serica* sp. nov. *B. australis* is most similar to *B. tenuis* sp. nov., which differs in the absence of a lateral carina on abdominal somites 3 to 5 and a dorsally situated lateral carina which makes the carapace flat on top.

Distribution

Off East London (32°S 28°E) at a depth of 75 m.

Bodotria glabra Jones, 1955

Bodotria glabra Jones, 1955: 282–284, figs 1–2.

Remarks

This species is known only from female and juvenile individuals in two plankton samples collected aboard the R.R.S. *William Scoresby* on the border of the southern African region. Distinguishing characters are: an elongate, flattish carapace (nearly two and a half times as long as deep, about one and a half times as long as wide) with a very faint lateral carina anteriorly; the basis of maxilliped 3 is stout, and the wide distal prolongation reaches the level of the carpus; the basis of pereiopod 1 is longer than the rest of the limb. The length of the ovigerous female is 4,5 mm. It is the only species occurring in Africa south of 20°S in which the endopod of the uropod is 1-segmented.

Distribution Off Cape Frio (19–20°S 12°E), plankton, 0–100 m.

Incertae sedis

Iphinoe? zimmeri (Stebbing, 1910)

Figs. 47–48

Iphinoe zimmeri Stebbing, 1910: 411–412, pl. 44.

Records

			adult ♂	sub-adult ♂	♂	ovig. ♀	♀	juv.	total	no. of records
FAL & FBY	34°S 18°E	17–44 m			3		2		5	4
SST	34°S 21°E	15–80 m	2	11	2	7	3	15	40	7
SCD	34°S 21°E–33°S 25°E	42–73 m	4	3	2	11	5	2	27	5

Previous records

East London (32°S 28°E), 75 m (Stebbing 1910).

Holotype

Adult male, deposited by Stebbing (1912) in the British Museum (Natural History). Type locality: 75 m, off East London (32°S 28°E).

Description

Ovigerous female, length 7,0 mm, from the south coast, near Port Elizabeth. Integument poorly calcified, translucent, with small shallow pits. Carapace (Fig. 47A) elongate, more than twice as long as deep, pointed anteriorly. Antennal notch (Fig. 47B) moderately deep, triangular. Anterolateral angle acute, rounded. Carapace in dorsal view (Fig. 47C) narrower anteriorly, pseudorostral lobes meeting for a short distance in front of eyelobe. Eyelobe small, pigmented,

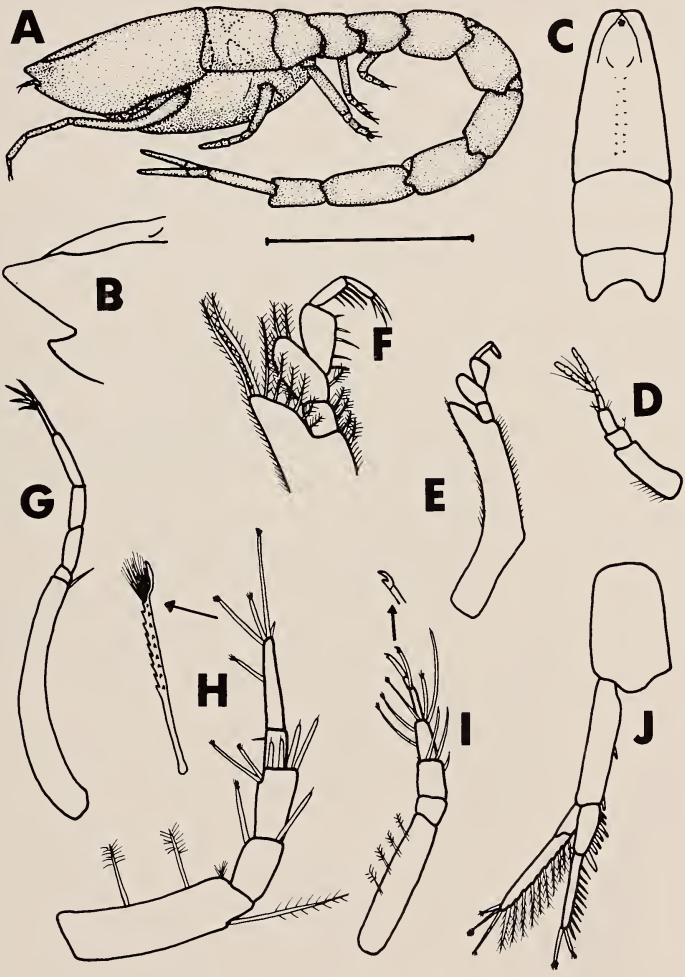

Fig. 47. *Iphinoe? zimmeri.*

Ovigerous female. A. Lateral view. B. Detail of anterior tip of carapace. C. Dorsal view of carapace. D. Antenna 1. E. Maxilliped 3. F. Distal tip of maxilliped 3. G. Pereiopod 1. H. Pereiopod 2. I. Pereiopod 3. J. Telsonic somite and uropod.

Scale line = 2 mm for A, C; 1 mm for B, E, G, J; 0,5 mm for D, F, H–I.

with very small scattered lenses. No middorsal carina—midline indicated by double rows of minute tubercles.

First pedigerous somite invisible, second very wide. Carapace subequal in length to free thoracic somites together. Gonad clearly visible as triangular orange patch laterally beneath integument of second pedigerous somite (dotted in Fig. 47A). Cephalothorax subequal in length to first five abdominal somites together. Abdomen cylindrical, each somite slightly produced posterolaterally.

Antenna 1 (Fig. 47D) short, first segment longer than next two together. Flagellum 2-segmented with two short aesthetascs. Accessory flagellum very small, 1-segmented.

Basis of maxilliped 3 (Fig. 47E) more than twice as long as remaining segments together, abruptly angled proximal to its mid-point. Distal prolongation (Fig. 47F) rather broad and short, reaching articulation of merus and carpus distally. Carpus slightly expanded.

Pereiopod 1 (Fig. 47G) slender, elongate, reaching beyond tip of pseudorostrum with carpus. Basis longer than remaining segments together. Ischium very short, merus, carpus and dactyl subequal in length, propodus slightly longer.

Pereiopod 2 (Fig. 47H) stout, 6-segmented. Basis equal in length to next three segments together. Carpus slightly longer than merus, well armed distally. Dactyl slender.

Pereiopods 3 (Fig. 47I) to 5 similar. Ischium, carpus and merus stout, propodus and dactyl very slender. All segments of pereiopods 2 to 5 distal to basis with very characteristic long, stout setae tipped with a brush of filaments.

Telsonic somite (Fig. 47J) one and a half times as long as wide, very slightly produced between uropods, subequal in length to peduncle. Peduncle subequal in length to rami with two very small spines on inner edge. First segment of exopod less than half length of second, unarmed. Second with 10 plumose setae on inner edge and three terminal spines wih apical bristles. First segment of endopod two-thirds length of second with seven spines on inner edge and two terminally with apical bristles.

Adult male, length 7,6 mm, from the south coast, near Port Elizabeth. As female, except as follows: integument very slightly wrinkled. Carapace (Fig. 48A) twice as long as deep, pseudorostral lobes (Fig. 48B) less pointed. Eye much larger, strongly pigmented, with six large lenses arranged in a ring. Antennal notch and anterolateral angle rounder and shallower. Carapace slightly depressed behind antennal notch and above posterior extremity of eyelobe. Gonad whitish, slightly visible through integument of second pedigerous somite. Sideplate of fourth pedigerous somite produced forward as linguiform process. Sideplates of abdominal somites defined ventrally. Ventral sternite (Fig. 48C) of third pedigerous somite produced into a crescentic ridge, of fourth with a rounded tubercle and of fifth with a larger, backward-pointing projection.

Antenna 1 (Fig. 48D) stouter, with fifteen aesthetascs surrounding flagellum.

Basis of pereiopod 1 longer. Pereiopods 3 (Fig. 48E) to 5 more slender, last four segments longer. Peduncle of uropod (Fig. 48F) armed with seven slender spines followed distally by about twenty-five serrated spines in two rows. Second segment of exopod with seventeen plumose setae on inner edge; first segment of endopod with ten serrate setae and second with twenty fine spines on inner edge.

Length

Adult male	7,9–8,4 mm
Ovigerous female	5,8–8,4 mm

Remarks

These animals are clearly the same as the one described by Stebbing (1910) as *Iphinoe zimmeri*. In almost all respects this species is typical of *Iphinoe*, particularly in the general appearance of the body, the anterior extension of the sideplate of the fourth pedigerous somite and the sternal processes of the males. However the fact that the first pedigerous somite is never visible in either sex excludes it from *Iphinoe* as the genus is now defined. The species does fit the

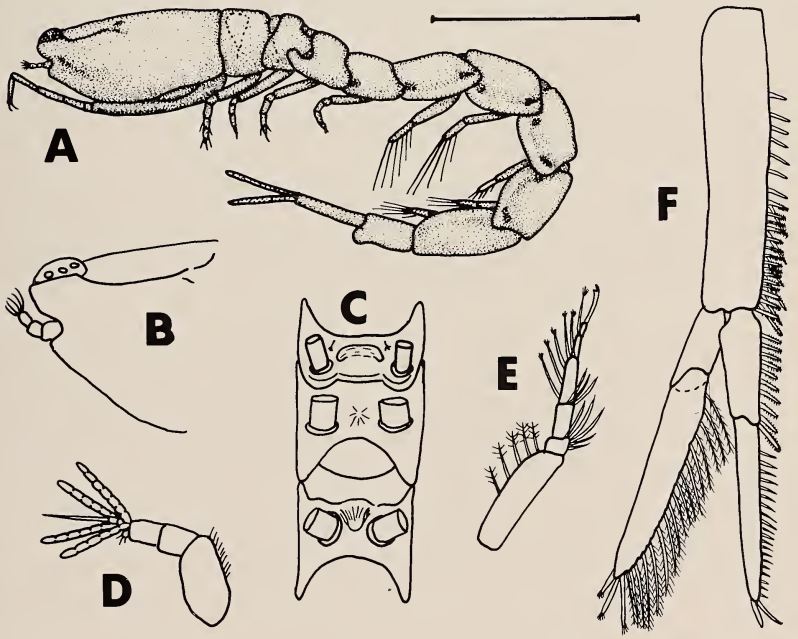

Fig. 48. *Iphinoe? zimmeri*

Adult male. A. Lateral view. B. Detail of anterior tip of carapace. C. Ventral sternites of pedigerous somites. D. Antenna 1. E. Pereiopod 3. F. Uropod.

Scale line = 2 mm for A; 1 mm for B–C, E; 0,5 mm for D, F.

generic diagnosis of *Bodotria*, but is patently unlike any other members of the genus. Since the state of the first pedigerous somite is the only character which reliably distinguishes between *Iphinoe* and *Bodotria*, altering the generic diagnosis of *Iphinoe* to accommodate this species would be untenable. So for the present at least the generic position of the species must remain uncertain.

Distribution

A fairly common species found between False Bay and East London at depths from 15 to 80 m.

DISTRIBUTION OF THE BODOTRIINAE

The rate of endemism is very high within the Bodotriinae as well as in the family as a whole. Of approximately 183 species only 25 (14%) occur across more than one major climatic or zoogeographic zone and 9 of these in more than one ocean: 4 of the 9 are found in both the Indian and Pacific Oceans, linking the Australasian, Indo-Chinese and Japanese fauna into an Indo-West-Pacific group; the other 5 demonstrate the strong link between the Mediterranean, eastern Atlantic and Indo-West-Pacific faunas—2 occur in the Mediterranean, west Africa and Indo-China, 1 in the Mediterranean, the Red Sea and Ceylon and 1 in west Africa and India, while the most widely distributed species of all, *Iphinoe crassipes*, occurs in the Red Sea, west Africa, South Africa and India.

The distribution of the species in the subfamily is detailed in Table 3. Each species may have more than one entry if it is known to occur in widely separate regions.

It is clear that, as with the Vaunthompsoniinae (Day 1975), the Bodotriinae are negatively amphipolar (Zimmer 1941). Not a single species is yet known from latitudes greater than 70° and only 4 per cent of the records are from latitudes

TABLE 3

Distribution of Bodotriinae according to depth and latitude (data mainly from Jones 1969)

	shore–5 m		5–200 m		200–2 000 m		>2 000 m		Total	
	no.	%	no.	%	no.	%	no.	%	no.	%
N of 70°N	—	—	—	—	—	—	—	—	—	—
70°N–50°N	—	—	4	<2	1	<1	1	<1	6	3
50°N–20°N	1	<1	44	21	—	—	1	<1	46	22
20°N–20°S	—	—	77	36	2	<1	1	<1	80	38
20°S–50°S	2	<1	70	33	6	<3	—	—	78	37
50°S–70°S	—	—	1	<1	1	<1	—	—	2	1
S of 70°S	—	—	—	—	—	—	—	—	—	—
Total no. of records	3	>1	196	92	10	5	3	1	212	
Total no. of species	3	>1	169	92	9	5	2	1	183	

greater than 50°. Fully 75 per cent occur between 20°N and 50°S. Although the Vaunthompsoniinae preponderate in the south temperate latitudes (48% between 20° and 50°S), there is a larger (38%) component of tropical species in the Bodotriinae and a smaller (37%) one of south temperate species. Were it not for the enormous diversification of the genus *Cyclaspis* in Australasia, the Bodotriinae would be very largely a tropical group.

The only ten species (less than 5%) known from the Western hemisphere (Western Atlantic and Eastern Pacific) are fairly widely spaced around the shores of North and South America, and each is known from only a few specimens. When one considers that most species in the Eastern hemisphere are also rather narrowly distributed, it becomes apparent that the powers of dispersion of these small, essentially benthic, ovoviviparous animals with no free larval stage are very limited. (This is not true, however, of the amphipods, some of which are very widely distributed. The mechanisms of dispersal in this group are uncertain, but it is widely agreed (Griffiths 1974) that rafting may play an important part. This method of dispersal would be strictly limited in the sand-dwelling Cumacea.)

It is a reasonable assumption that the ancestral bodotriids originated in the warmer tropical or subtropical waters of the Indo-West-Pacific, possibly in what is now the Indo-Malayan region, spreading along the continental shelves, with very few pioneers reaching the new world across the Atlantic and Pacific Oceans. Similar distribution patterns are found in many other groups. However, Eckman (1953) warns that the present richness of the fauna in the Indo-West-Pacific does not necessarily mean that in times past it has acted as a main centre for distribution. It may simply be that conditions in this area have been more stable so that a greater part of the original Tethys fauna has been sustained here than it has been, for example, in the Atlantic.

The vast majority of known species (93%) occurs at depths of less than 200 m. But the implication that the deep oceans are practically devoid of Bodotriinae is perhaps misleading. For example, five of the seven southern African species from 200 m and deeper are new, so that it is likely that the apparent lack of deep-water species is due rather to a scarcity of collecting. The two species previously known, both represented until now by a single specimen, were found in considerable numbers in the present surveys, suggesting that the numbers of individuals may also be greater than anticipated. This is borne out by the work of Jones & Sanders (1972), who analysed the Cumacea of deep waters in the North Atlantic, and concluded that the Cumacea are far more important in deep waters than previously estimated, in numbers both of species and of individuals.

DISTRIBUTION OF THE SOUTHERN AFRICAN BODOTRIINAE

It is intended to discuss the zoogeography of the southern African Cumacea more fully at a later date when all the families have been examined. Thus in the

present study, no attempt has been made to distinguish provinces or regions, since too small a number of genera and species is available in the Bodotriidae alone to allow significant conclusions to be drawn.

The west coast of southern Africa is essentially a region of cold water (bottom temperature about 10°C at a depth of 50 m), the south coast between the Cape Peninsula and East London is a region of cool water (bottom temperature 12–14°C at a depth of 50 m) and the east coast north of East London is one of warm water (bottom temperature more than 18°C at a depth of 50 m). The Bodotriinae from depths less than 200 m are generally confined to rather narrow areas, and may be divided into groups according to their distribution around the coast:

1. Cold-water species occurring on the west coast as far south as False Bay—five species: *Iphinoe africana* (from 16°S), *I. fagei*, *Upselaspis caparti*, *Bodotria vertebrata semicarinata*, *B. glabra* (19–20°S).
2. Cool-water species occurring to the west and east of False Bay or off the Cape Peninsula only—ten species: *Bodotria magna*, *B. nitida*, *B. elevata*, *B. montagui*, *B. serica*, *Austrocuma platyceps*, *Iphinoe stebbingi*, *I. dayi*, *I. capensis*, *Eocuma foveolatum*.
3. Warmer-water species occurring along the south coast from False Bay to East London—six species: *Bodotria falsinus*, *B. clara*, *B. vertebrata vertebrata*, *B. australis*, *Eocuma* sp., *Iphinoe? zimmeri*.
4. Subtropical species occurring along the Natal and Mozambique coasts—five species: *Eocuma winri*, *Mossambicuma elongatum*, *Iphinoe truncata*, *Cyclaspis scissa*, *C. australora*.
5. *Iphinoe crassipes* and *I. senegalensis* are the only shallow-water species whose ranges extend well out of the southern African region. *I. senegalensis* occurs in west Africa with only a single doubtful record from South Africa. *I. crassipes*, on the other hand, is very widely distributed, being known from the Red Sea, west Africa, India and Ceylon, as well as South Africa, where it occurs in warmer waters from Saldanha Bay to Natal.
6. A further group consists of seven species from depths greater than 200 m. In general there are fewer records, so that their limits are less accurately known, but they do tend to be more widespread than are shallow-water species. They are *Iphinoe producta* (west coast only), *Cyclaspoides pellucidus* and *Cyclaspis spectabilis* (off the Cape Peninsula to the southern Mozambique Channel), *Bodotria tenuis* (off Still Bay to the southern Mozambique Channel), *Eocuma aculeatum* (southern Mozambique Channel only) and *Alticuma bellum* (Natal to southern Mozambique Channel). *Alticuma carinatum* is the most widespread of this group, occurring in many deep-water hauls from Lambert's Bay eastwards. It is also known from a single specimen further north off Kenya.

It appears that there is a real geographical barrier separating tropical west coast species from those of the south-west African region (group 1). The limiting factor is probably temperature, since the northern extent of the cold

Benguela current is felt at about 18°S, which is about the northern limit of the species in group 1.

The depth ranges of the shallow-water species are very much more limited than those of species from deeper waters and can be divided into five groups according to their depth distribution. The sixth and deepest group is included for the sake of completeness.

Depth range in metres (approximate)	Number of species
0–4	4
3–20	3
20–50	4
20/30–80/90	12
20–200	3
> 200	7

It can be seen that the maximum depth at which each group occurs is very approximately double that of the previous group. The water pressure would also double at depths of 10, 20, 40, 80 m, etc., and these depths correspond fairly well with major changes in the fauna. It is not possible to say how well this relationship would hold at greater depths, due to the very small numbers of samples and individuals from these areas.

Despite the correlation between pressure and faunal changes it is likely that temperature—or a temperature-related parameter—is of more significance in controlling depth distribution. This statement is borne out by the fact that many species occur at greater depths the further east they are found, because the temperature contours are deeper on the warmer east coast than on the cooler west coast. A similar effect is shown by Millard (1978) for the southern African Hydrozoa.

A further factor which must be important in controlling the distribution of bodotriids is the size and composition of the substrate, since these animals are burrowing detritivores. Due to their very small size they presumably require fairly fine, well-sorted sediments. Particle size determinations for many of the UCT and NIWR samples may later become available for analysis, at which time this problem may be solved at least partially.

The material from the collections at hand has added to our knowledge not only of the local cumacean fauna but also of the depth distribution of several genera. *Cyclaspis scissa* sp. nov. and *C. australora* sp. nov. are the first shallow-water species in the genus recorded from Africa. *Bodotria* and *Eocuma* have always been considered to be distinctly shallow-water genera, but *B. tenuis* sp. nov. has increased the known depth range for its genus from 120 m to 550 m, and *Eocuma aculeatum* sp. nov. has increased that of *Eocuma* from 108 to 550 m. *Cyclaspoides pellucidus* sp. nov. is the second species known in the genus and the first from the Southern hemisphere. *Mossambicuma* and *Austrocuma* are new genera from previously unsampled areas (a tropical estuary and a Cape

shore respectively). *Alticuma* establishes a new genus consisting of two deep-water species.

The rate of endemism appears to be extremely high. In the southern African Vaunthompsoniinae it is of the order of 70 per cent (7 endemics out of 11 species), but in the Bodotriinae 28 (82%) of the 34 species have been found south of 20°S only. The ranges of another four extend beyond this limit, but none of these is found in any other areas. One record (*I. senegalensis*) is a doubtful identification and only one species (*I. crassipes*) occurs from equatorial Africa to India. It should be stressed, however, that very little data is available from the regions due north of the area under consideration so that these figures must be treated with caution.

Finally, 4 586 specimens of 31 species in 607 records were examined in this study. This gives a figure of 7,5 individuals per record and a specimen : species ratio of 148 : 1. In comparison, the Vaunthompsoniinae gave figures of 77 specimens, 11 species and 42 records with 1,8 individuals per record and a specimen : species ratio of 7 : 1. Thus the Bodotriinae exhibit much lower diversity and a much higher rate of occurrence than do the Vaunthompsoniinae in the same area. The ecological reasons for these differences are not clear, but the immediate cause is the very large number of specimens of some very successful species, particularly *Iphinoe africana* with 1 603 individuals and *I. stebbingi* with 1 186. These two species account for over half the number of individuals. The other numerically successful species are *I. dayi* (152 individuals), *I. crassipes* (143), *Bodotria magna* (200), *B. nitida* (238) and *B. serica* (108). Thus 7 species (about 20% of the total) account for 2 630 (nearly 60%) of individuals. In fact *Iphinoe* and *Bodotria* together account for 21 (about 65%) of the species and 93 per cent of the individuals. Without them the specimen : species and individual : record ratios would be much the same as they are in the Vaunthompsoniinae.

In conclusion, the Bodotriidae are the most successful of the cumacean families in southern African waters, both in numbers of species and of individuals. Preliminary estimates suggest that the Diastylidae will prove to be almost as diverse, although not as numerous, while the other families are relatively poorly represented.

ACKNOWLEDGEMENTS

I should like to thank the following people in South Africa for giving me the opportunity to examine and describe material: Dr Brian Kensley of the South African Museum; Mr Tim McClurg and Mr A. C. Connell of the National Institute for Water Research of the Council for Scientific and Industrial Research; Mr Larry Hutchings of the Sea Fisheries Branch; Dr J. Grindley and the late Dr Robin Boltt. I am also very grateful to Miss Joan Ellis of the British Museum (Natural History), Dr. N. S. Jones and Dr P. LeLoeuff for allowing me to examine some west African material, and to Dr M. Băcescu of the Museé

d'Histoire Naturelle in Bucharest for providing some almost unobtainable literature. I am grateful, too, to Mrs Sue Frost and Miss Judy Miller for technical and clerical assistance, and to many other people who have provided me with odd specimens found during their own collecting programmes.

REFERENCES

BĂCESCU, M. 1950. Speciile de *Iphinoe*. *Anal. Acad. rom.* [Bucharest] **3**(12): 1–54.

BĂCESCU, M. 1961. Contributions à l'etude des Cumacés de la Méditerranée et particuliérement des côtes d'Israel. *Rapp. P.-v. Réun. Comm. int. Explor. scient. Mer. Méditerr.* **16**: 495–502.

BĂCESCU, M. 1975. New Cumacea from the Red Sea. *Trav. Mus. Hist. nat. "Gr. Antipa"* **16**: 35–69.

BATE, S. 1856. On the British Diastylidae. *Ann. Mag. nat. Hist.* (2) **17**: 449–465.

BONNIER, J. 1896. Resultat scientifique de la Campagne du "Caudan" dans le Golfe de Gascogne. III. *Annls Univ. Lyon.* **26**: 529–562.

CALMAN, W. T. 1904*a*. Report on the Cumacea collected by Prof. Herdman at Ceylon in 1902. *Ceylon Pearl Oyster Fish. suppl. Rep.* **12**: 159–180.

CALMAN, W. T. 1904*b*. The marine fauna of the west coast of Ireland. *Scient. Invest. Fish. Brch. Ire.* **1**: 1–52.

CALMAN, W. T. 1905. The Cumacea of the *Siboga* Expedition. *Siboga Exped. Monograph* **36**: 1–23.

CALMAN, W. T. 1907*a*. On new or rare Crustacea of the order Cumacea from the collection of the Copenhagen Museum. I. The families Bodotriidae, Vaunthompsoniidae and Leuconidae. *Trans. zool. Soc. Lond.* **18**: 1–58.

CALMAN, W. T. 1907*b*. Sur quelques Cumacés des côtes de France. *Bull. Mus. natn. Hist. nat., Paris* **16**: 116–123.

DAY, J. 1975. South African Cumacea. Part I. Family Bodotriidae, subfamily Vaunthompsoniinae. *Ann. S. Afr. Mus.* **66**: 177–220.

ECKMAN, S. 1953. *Zoogeography of the Sea*. London: Sidgwick & Jackson.

FAGE, L. 1928. Cumacés. Voyage de la Goellette "Melita" au Senegal (1889–1890). *Bull. Soc. zool. Fr.* **53**: 331–339.

FAGE, L. 1951. Cumacés. *Result. scient. Expéd. oceanogr. belge Eaux côt. afr. Atlant. Sud* **3**: 1–9.

FISCHER, P. 1872. *In*: FOLIN A. G. L. DE & PÉRIER, L. *Les Fonds de la Mer* **2**: 47. Paris

GÂMO, S. 1967. Studies on the Cumacea (Crustacea, Malacostraca) of Japan. Part I. *Publs Seto mar. biol. Lab.* **15**: 133–163.

GOODSIR, H. 1843. Description of the genus *Cuma* and two new genera nearly allied to it. *Edinb. New phil. J.* **34**: 119–180.

GRIFFITHS, C. L. 1974. The gammaridean and caprellid Amphipoda of southern Africa. Unpublished Ph. D. Thesis, University of Cape Town.

HALE, H. M. 1944*a*. Australian Cumacea. No. 7. The genus *Cyclaspis*. *Rec. S. Aust. Mus.* **8**: 63–142.

HALE, H. M. 1944*b*. Australian Cumacea. No. 8. The family Bodotriidae. *Trans. R. Soc. S. Aust.* **68**: 225–285.

HALE, H. M. 1953. Two new Cumacea from South Africa. *Trans. R. Soc. S. Aust.* **76**: 45–50.

HANSEN, H. J. 1895. Isopoden, Cumaceen und Stomatopoden der Plankton-Expedition. *Ergebn. Plankton-Exped.* **2**: 1–105.

JONES, N. S. 1955. Cumacea of the Benguela Current. '*Discovery*' *Rep.* **27**: 279–292.

JONES, N. S. 1956. Cumacea from the west coast of Africa. *Atlantide Rep.* **4**: 183–212.

JONES, N. S. 1960. Cumacea from South Africa. *Ann. Mag. nat. Hist.* (13) **2**: 171–180.

JONES, N. S. 1969. The systematics and distribution of Cumacea from depths exceeding 200 m. *Galathea Rep.* **10**: 99–180.

JONES, N. S. & SANDERS, H. L. 1972. Distribution of Cumacea in the deep Atlantic. *Deep Sea Res.* **19**: 737–745.

KEMP, S. 1916. Fauna of the Chilka Lake. Cumacea. *Mem. Indian Mus.* **5**: 395–402.

Kossmann, R. 1880. *Zoologische Ergebnisse einer im Auftrage der Königlichen Akademie der Wissenschaften zu Berlin ausgeführten Reise in die Küstengebiete des Rothen Meeres.* II. Hälfte, I. Lief., III Malakostraken. 88–92. Leipzig.

Kurian, C. V. 1951. The Cumacea of Travancore. *Bull. cent. Res. Inst. Univ. Travancore* (C) **2**: 77–118.

Kurian, C. V. 1954. Notes on the Cumacea (Sympoda) in the Zoological Survey of India. *Rec. Indian Mus.* **52**: 275–311.

Kurian, C. V. 1961. Three species of Cumacea from the lakes of Kerala. *Bull. cent. Res. Inst. Univ. Kerala* (C) **8**: 55–61.

LeLoeuff, P. & Intes, A. 1972. Les Cumacés du plateau continental de Côte d'Ivoire. *Cah. Off. Rech. Sci. Tech. Outre-Mer.* **10**: 19–46.

LeLoeuff, P. & Intes, A. In press. Les *Bodotria* (Crustacea, Cumacea) des mers d'Europe et des côtes occidentales de l'Afrique tropicale. *Bull. Mus. natn. Hist. nat. Paris.*

Millard, N. A. H. 1978. The geographical distribution of southern African hydroids. *Ann. S. Afr. Mus.* **74**: 159–200.

Marcussen, J. 1894. Ueber ein neues Cumaceengenus *Eocuma*, Family Cumadae, aus Japan. *Sber. Ges. naturf. Freunde Berl.* **1894**: 170–171.

Montagu, G. 1804. Description of several marine animals found on the south coast of Devonshire. *Trans. Linn. Soc.* **7**: 61–85.

Norman, A. M. 1867. On the Crustacea. . . . Report of the committee exploring the coast of the Hebrides. *Rep. Br. Ass. Advmt Sci.* **36**: 193–206.

Sars, G. O. 1865. Om den aberrante Krebsdyrgruppe Cumacea og dens nordiske arter. *Forh. VidenskSelsk. Krist.* **1864**: 128–208.

Sars, G. O. 1871. Beskrivelske of fire vestindiske Cumaceer opdagede of Dr A. Goes. *Öfvers. K. VetenskAkad. Forh.* **28**: 803–811.

Sars, G. O. 1878. Middelhavets Cumaceer. Part 1. *Arch. Math. Natur.* **3**: 461–512.

Sars, G. O. 1879. Middelhavets Cumaceer. Part 2. *Arch. Math. Natur.* **4**: 1–126.

Scott, T. 1901. Notes on some gatherings of Crustacea collected for the most part on board the Fishery Steamer "Garland" and examined during the past years. *Rep. Fishery Bd. Scotl.* **19**: 273.

Stebbing, T. R. R. 1910. Sympoda. *Ann. S. Afr. Mus.* **6**: 409–419.

Stebbing, T. R. R. 1912. South African Crustacea. Part 6. The Sympoda. *Ann. S. Afr. Mus.* **10**: 129–176.

Stebbing, T. R. R. 1913. Cumacea. *Tierreich* **39**: 1–210.

Zimmer, C. 1907. Neue Cumaceen von der Deutschen und der Schwedischen Südpolar-expedition aus der Familien der Cumiden, Vaunthompsoniiden, Nannastaciden und Lampropiden. *Zool. Anz.* **31**: 367–374.

Zimmer, C. 1908. Die Cumaceen der „Deutschen Tiefsee-Expedition". *Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia'* **8**: 155–196.

Zimmer, C. 1914. Cumacea. *Fauna Südw.Australiens.* **5**: 175–195.

Zimmer, C. 1916. Cumacea und Schizopoda. *Beitr. Kennt. Meeresfauna Westafr., Crust.* **4**: 55–66.

Zimmer, C. 1921. Mitteilung über Cumaceen des Berliner Zoologischen-Museums. *Mitt. zool. Mus. Berl.* **10**: 117–149.

Zimmer, C. 1936. California Crustacea of the order Cumacea. *Proc. U.S. natn. Mus.* **83**: 423–439.

Zimmer, C. 1941. Cumaceen. *Bronn's Kl. Ordn. Tierreichs* **5** (1, Book 4): 1–222.

Zimmer, C. 1942. Die Gattung *Iphinoe* (Ord. Cumacea, Fam. Bodotriidae). *Zool. Anz.* **139**: 190–200.